

# LiquiTrak<sup>®</sup>

## Nonvolatile Residue Monitor Model 8000

The new LiquiTrak Nonvolatile Residue Monitor (NRM Model 8000) incorporates a stunning, patented, water-based detector\*. Its optimized design features are combined with the proven, unique method of measuring residue after evaporation (RAE). Here are more of the advantages you will enjoy with the Model 8000, now more affordable than ever.

### Benefits

- Detects dissolved inorganic material including both dissolved and colloidal silica.
- Detects contaminants missed by other water monitoring techniques.
- Superior sensitivity and wide dynamic range from an ultrasensitive 1 part per trillion to 60 parts per billion.
- Rapid response time (less than 90 seconds) to detect a change in contamination levels.
- Water from your ultrapure water system supplies the working fluid – eliminating the need for n-butyl alcohol.
- Wide dynamic range eliminates the need for diffusion screens to cover the measurement range.
- Innovative inlet flow monitor indicates blockages and ensures flow stability.
- Reliable – minimal maintenance requirements. Incorporates an easy access back flush system to clear flow orifice blockages.
- Universal power supply, digital sensors, and expanded communications including a USB port, RS-232 serial port, and 4-20 mA analog output.
- Front panel display for easy viewing.
- Updated software for trend monitoring and long term data collection.
- Small, light, and rugged – half the volume of previous NRM models.

In today's semiconductor manufacturing world of shrinking line geometries, it is critical to use water of the highest purity to limit damaging defects. Thousands of liters of ultrapure water (UPW) are used to wash and process a single wafer. Any dissolved impurities that remain on the wafer's surface after washing can cause defects in the resulting semiconductor devices. Instrumentation that can provide early detection of contamination in the UPW therefore helps control or prevent costly defects.

The NRM is an industry standard for the reliable measurement of dissolved inorganic or colloidal silica impurities in UPW systems for the microelectronics industry. The NRM detects contaminants that other detectors such as TOC monitors, particle counters, and on-line reactive silica monitors do not detect. The NRM is frequently the first instrument to indicate water quality degradation and as such can offer a distinct competitive advantage.

The NRM is the only available instrument meeting the ASTM Standard D5544-05, "Standard Test Method for On-Line Measurement of Residue After Evaporation of High Purity Water."

### Applications

- Monitor mixed-bed ion-exchange breakthrough in UPW systems.
- Monitor lifespan of UPW system components such as ultra filters.
- Detect nm-sized contaminants undetectable by other instrumentation.
- Monitor trends for early detection and anticipation of UPW problems.
- Develop and test filters with colloidal silica challenges.
- Troubleshoot UPW systems, including testing and selecting components to produce the cleanest water possible.



\* U.S. Patent Number 6,712,881.  
Other patents pending.





Dr. David Blackford is founder and President of Fluid Measurement Technologies, Inc., a worldwide supplier of instrumentation and measurement services for analyzing contamination in high purity water systems. Standing in front of the high-purity water system in FMT's headquarters in White Bear Lake, Minnesota, David holds the LiquiTrak® NRM Model 8000 with just one hand. Fortunately, David's new NRM is considerably more reliable than his '66 MG.

## Operating Principal

The NRM employs a patented technology where ultrapure water is sprayed into a fine mist of droplets that are heated and dried, leaving behind an ultrafine aerosol of the non-volatile residue impurities. The ultrafine residue aerosol is then detected optically using a water-based condensation detector: the signal generated is in direct proportion to the quantity of impurities in the water. The NRM is calibrated according to ASTM Standard D5544-05 using potassium chloride, a material with density similar to colloidal silica.



Nebulizer flowrate trend graph (2 hours)



Raw count data and incoming water pressure (psi)



Residue after evaporation trend graph (2 hours)



Instrument status screen providing operational parameters



Current ppt reading and nebulizer flow rate (mL/min)

## Specifications

Displayed measurement range	0.001 to 60 ppb
Response time to impurity change	Less than 90 seconds
Sample flow rate	1.5-3.0 ml/min (calibrated drip counter flow meter)
Total flow rate	120 ml/min
Inlet water pressure	138 to 483 kPa; 20 to 70 psig (a suitable water drain is required)
Compressed air flow rate/pressure	25 L/min at 345 kPa; 50 psig (compressed air should be dry and free of particles— Nitrogen may be substituted for compressed air)
Residue drying temperature	120°C (248°F)
Wetted surface materials	Sapphire, PFA Teflon®, PTFE, and 316L stainless steel
Detector working fluid	Water, supplied by the UPW system
Ambient temperature range	15°-35°C (59°-95°F)
Ambient relative humidity range	0-85%
Maximum water temperature	80°C (176°F)
Dimensions (WDH)	41 × 36 × 22 cm (16.2 × 14.1 × 8.5 inches) (depth is 40 cm, 15.7 inches including the fittings on back)
Weight	8 Kg (18 lbs)
Power	Universal 100 to 230 VAC, 50/60 Hz, 125 VA
Output	USB, RS-232 and 4-20 mA (Ethernet adapter optional )
Ultrapure water inlet	1/4 inch PFA Flaretek®
Waste outlet	1/2 inch SS Swagelok®
Compressed air inlet	1/4 inch SS Swagelok®
Software	Data acquisition program included, Windows® XP/7 platform

Specifications subject to change without notice.

## Bibliography

Blackford, David B. "The Measurement of Nonvolatile Residue in High-Purity Water," Journal of Process Analytical Chemistry, Vol. IV, No. 3,4, Winter 1998-99.

Hering, Susanne V. and Mark R. Stolzenburg. "Continuous, laminar flow water-based particle condensation device and method," US Patent 6,712,881, March 30, 2004.

Fluid Measurement Technologies (FMT) Inc., established in 1998, designs cutting-edge metrology tools for monitoring contamination in the world's cleanest water systems. An acknowledged world leader in the field, FMT founder, Dr. David Blackford, currently has six US patents, one Korean patent and three US patents pending, and over 50 technical publications for his innovative technologies.

Fluid Measurement  Technologies, Inc.

To order the LiquiTrak® NRM (Nonvolatile Residue Monitor) Model 8000:

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