THORNTON
Leading Pure Water Analytics

Power Industry

Process Analytical Solutions

Optimizing Power Plant Chemistry

METTLER TOLEDO

METTLER TOLEDO
Commitment to Innovation and Quality

METTLER TOLEDO Group

Our company specializes in providing precision instrument equipment and related services to industrial customers. In 2013, METTLER TOLEDO generated revenues of US$ 2.4 billion. The company's stock has been publicly traded on the New York Stock Exchange since 1997.

Worldwide presence

We have a worldwide distributor network and a workforce of more than 12,500 employees. We support our customers in industry by providing comprehensive solutions for each step of their manufacturing processes – from receipt of materials throughout all manufacturing stages with in-line process measurement, through to final packaging control, logistics and shipping.

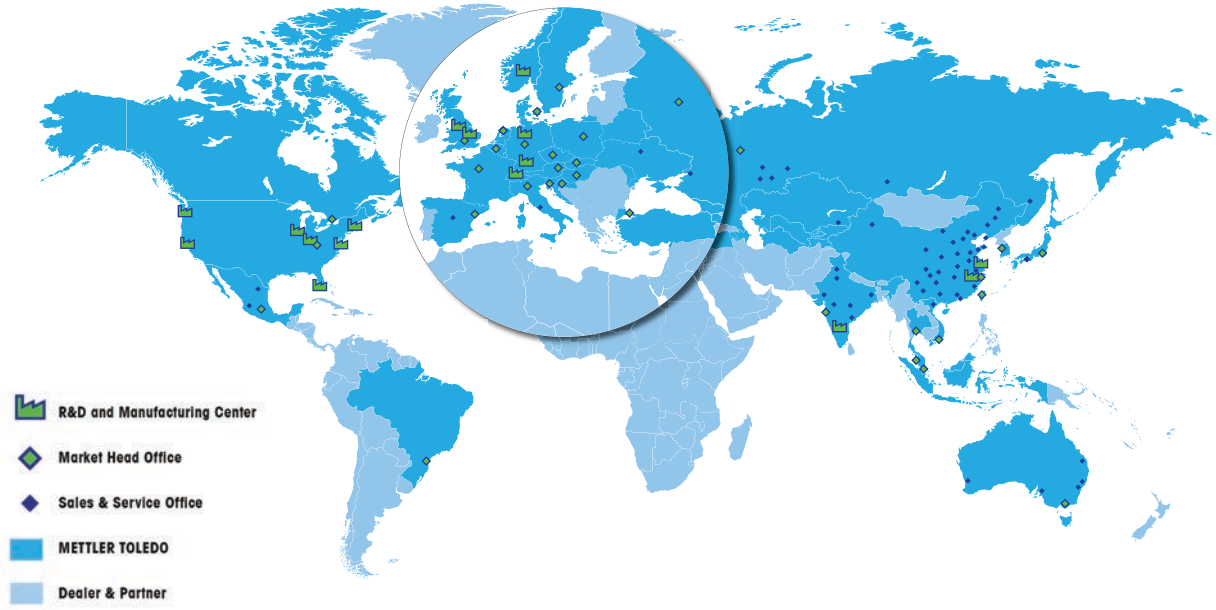
METTLER TOLEDO instruments are used in research and development, manufacturing process control and for quality control. The pharmaceutical, biotech, chemical, food and beverage, power, and cosmetic industries are among the principal users.

Innovation and quality

Our company enjoys an excellent reputation as an innovator demonstrated by R&D expenditures above the average for the industry. We make every effort to achieve the highest level of quality, by applying Total Quality Management at both the product and process level, particularly as part of the support we provide to our customers to help them comply with international guidelines.

Process Analytics Division

Within the METTLER TOLEDO Group, the Process Analytics Division concentrates on in-line analytical system solutions for industrial manufacturing processes. The Division consists of two business units, Ingold and Thornton, both internationally recognized leaders in their respective markets and technologies.



Thornton – Leading Pure Water Analytics

Over forty-five years ago, Thornton designed and manufactured the original analog resistivity/ conductivity meters for ultrapure water. As a leader, we helped refine the data for pure water conductivity properties and became the measurement standard in the microelectronics industry, while gaining wide acceptance in makeup water treatment for the power industry.

Industry Leadership
Thornton technology leadership is based on an in-depth knowledge of critical ultrapure water (UPW) measurement technology and extensive application expertise. Our innovative multi-parameter instruments and sensors are specified to monitor UPW systems worldwide.

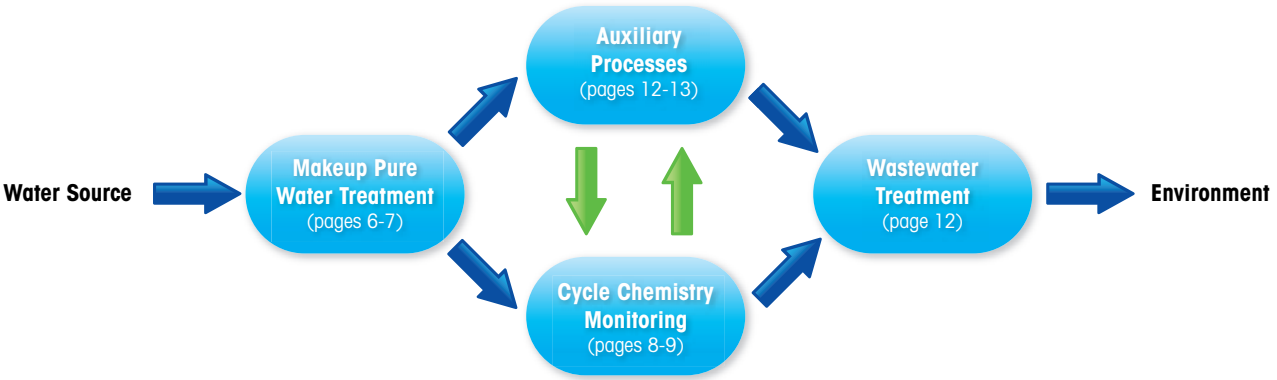
Expansive measurement capabilities allow our instruments to be utilized throughout the entire water cycle: from makeup water to cycle chemistry to cooling to waste water, reclaim and recycle.

As part of the METTLER TOLEDO Process Analytics Group, Thornton has developed world-class technology in the areas of conductivity, sodium, silica, pH, ORP, dissolved oxygen and total organic carbon measurement. We continue to provide innovative solutions with expanded measurement capabilities to meet the demanding requirements of the thermal power generation industry.

Our extensive global support infrastructure provides local sales and service for all METTLER TOLEDO Thornton products in most regions of the world.

Industry Participation
As a technical leader in ultrapure water measurements, our staff members lead or participate in the following power-related organizations and conferences:

- ASTM D19 Water Committee, Task Group Chairman
- Ultrapure Water Conference, Participant and featured Industry Expert
- EPRI, VGB, Eskom and other power industry conferences
- International Water Conference, papers and presentations
- International Association for the Properties of Water and Steam, member



Innovative Measurement Solutions
For Advanced Process Analytics

Intelligent Sensor Management (ISM®) is a proven technology embedded in a sensor, which outputs a robust digital signal, retains unique factory and current calibration data and predicts a sensor's need for maintenance, calibration or replacement. ISM provides improved accuracy, reliability, and safety for critical applications.

ISM is available across our product solutions for measuring pH, conductivity, dissolved oxygen, sodium, silica and TOC. This unique technology eases sensor handling, enhances performance, and lowers sensor lifecycle costs.

Fast Startup

- Plug and Measure feature ensures measurement point start up is fast and error free.

Predictive Diagnostics

- Advanced algorithms in the sensor provide real-time information on sensor "health".
- Tools such as the Dynamic Lifetime Indicator (DLI) and Adaptive Calibration Timer (ACT) allow proactive maintenance.

Proactive Maintenance

- Notifications for upcoming service save time and expenditure.
- Maintenance schedules can be optimized to reduce costs and avoid unplanned downtime.

M300 Multi-parameter Transmitter

- Multi-parameter capability reduces inventory
- Plug and Measure simplicity with ISM for rapid start up
- One or two channels of measurement

M800 Multi-parameter Transmitter

- Up to four channels of measurement
- iMonitor screen provides real-time evaluation of sensor condition
- Predictive diagnostics to proactively plan sensor maintenance

Wide Range UniCond® Conductivity Sensors

- Certified, unique calibration data stored in memory
- ISM technology provides higher accuracy with greatly extended measurement range
- Robust digital signal directly from the sensor

Fast Responding Optical Dissolved Oxygen Sensor

- Reliable measurement based on chemiluminescence
- Low maintenance with no membrane, electrolyte or electrodes
- No hydrogen interference in stator cooling monitoring

ISM®

www.mt.com/ism-power

Leading Analytical Measurements
For Makeup Water Treatment

Controlling high purity water treatment requires sensitive and accurate analytical instrumentation. As a leader in deionized water quality measurement, METTLER TOLEDO Thornton is the accepted instrumentation standard for many makeup water treatment systems fabricators.

METTLER TOLEDO Thornton multi-parameter transmitters and sensors provide a solid platform for measurements throughout the makeup water system.

Reverse osmosis system operation demands continuous monitoring to detect abnormal operating conditions and prevent damage to costly membranes.

Our instrument platforms include measurements of pH and ORP to protect membranes. The same platforms measure conductivity, temperature and flowrate for close surveillance of membrane performance.

Efficient operation and regeneration of ion exchangers also depend on continuous monitoring of key parameters. Our UniCond conductivity, 2300Na sodium, 2800Si silica and 5000TOCi total organic carbon (TOC) analyzers provide a complete picture of water quality.

Measurement Parameters

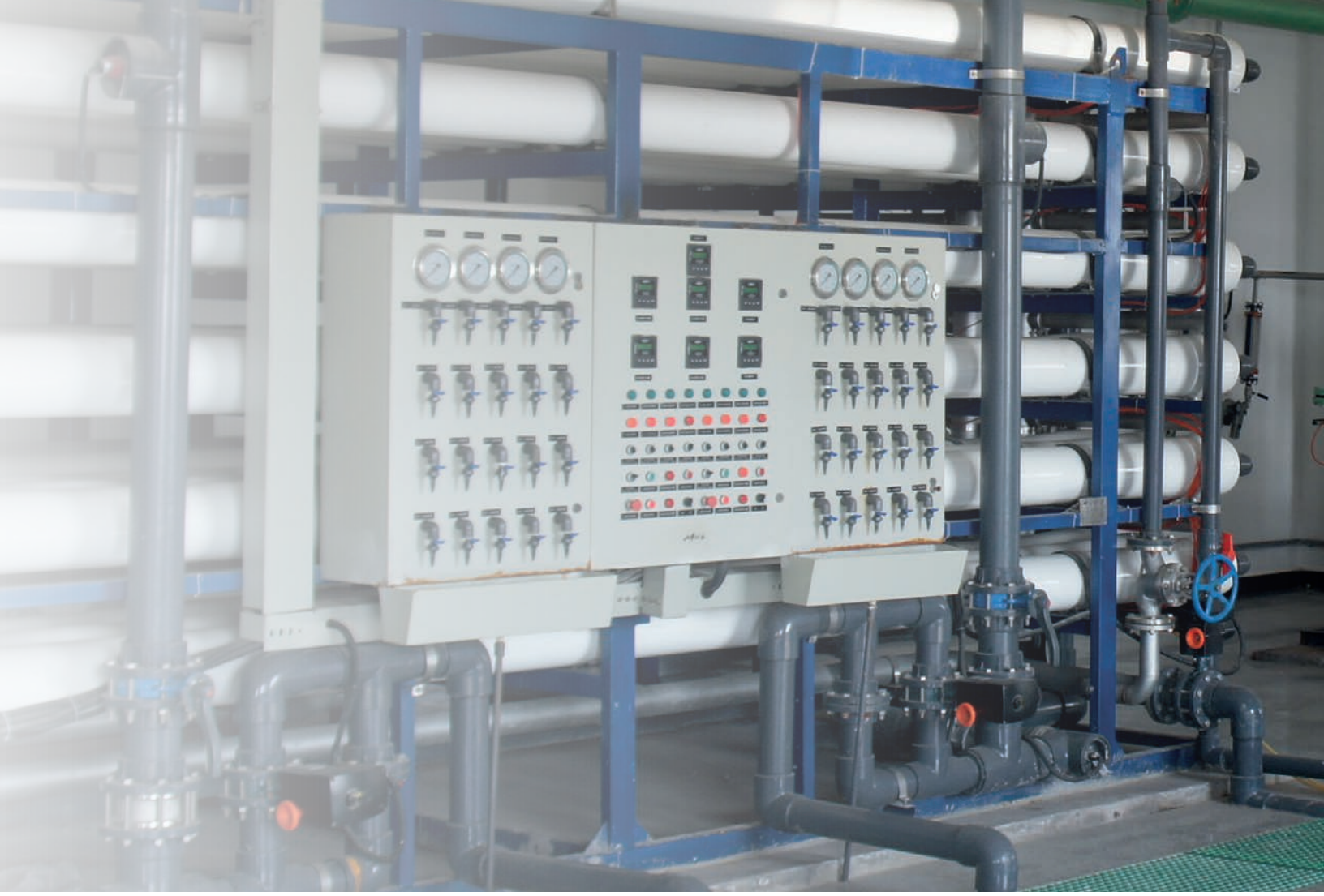
- pH/ORP
- Conductivity and % Rejection
- Flow and % Recovery
- Sodium
- Silica
- Dissolved Oxygen
- TOC

M800 Multi-parameter Transmitter

- Up to four channels of measurement
- iMonitor screen provides real-time evaluation of sensor condition
- Predictive diagnostics to proactively plan sensor maintenance

Compact pH/ORP Sensors

- pH and ORP measurement from a single probe
- Digital signal reliability
- Predictive maintenance enabled with ISM



Visit the competence center
www.mt.com/pro_power

Wide Range UniCond® Conductivity Sensor

- Plug and Measure simplicity with highest factory calibration accuracy
- Wide range, covers entire makeup treatment system with one model
- Digital signal reliability

Continuous Reading 5000TOCi Total Organic Carbon Sensor

- Warns of organic fouling of anion exchange resin
- Detects ppb organics in cogeneration condensate return
- Up to four TOC sensors on a single M800 transmitter

Reliable Measurements
Reduce Corrosion and Deposition

Long-term efficient power generation requires careful surveillance to guard against corrosive and depositing conditions and to assure conformance with EPRI, VGB, IAPWS or other guidelines. METTLER TOLEDO Thornton expertise for these measurements includes high performance sensors and analyzers.

Especially low-volume sensor housings ensure timely response by preventing accumulation of corrosion products around sensing elements.

UniCond conductivity sensors produce highest accuracy measurements due to system calibration of built-in measuring circuit, cell constant and temperature sensor. From accurate conductivity measurements, calculated pH is available in all of our transmitters.

pHure Sensors give reliable direct pH measurement with minimal maintenance - a critical backup if upset conditions go outside the limits for accurate pH calculation.

METTLER TOLEDO Thornton offers both optical and electrochemical dissolved oxygen sensor technologies to achieve control at ppb levels appropriate for the cycle chemistry treatment used.

Our sodium and silica analyzers provide highly sensitive monitoring of deionization and steam quality to prevent corrosion and deposition on turbines.

Measurement Parameters

- Specific, cation, and degassed cation conductivity
- Calculated pH
- pH/ORP by electrode
- Dissolved oxygen
- Sodium, Silica
- TOC

Fast Responding Optical Dissolved Oxygen Sensor

- Plug and Measure capability with ISM
- Excellent long-term stability
- Low maintenance without membrane, electrolyte or electrodes

Fully Automatic 2300Na Sodium Analyzer

- Minimal operator supervision
- Unattended automatic electrode conditioning and calibration
- Convenient grab sample capability

Low Maintenance 2800Si Silica Analyzer

- Adjustable measurement interval for reagent savings
- Unattended automatic span calibration
- Zero calibration with each measurement

pHure pH and UniCond® Sensors Optimized for Pure Waters

- Highest accuracy pH measurement due to flowing liquid electrolyte
- Wide conductivity electrode spacing prevents fouling
- Precise temperature compensation for specific and cation conductivity samples

Sequencers and Mini Panels
for Trace Contamination Detection

In targeted power applications, multi-stream sequencing and trace contamination detection are key factors in effectively measuring specific parameters. METTLER TOLEDO Thornton sequencers have the capability to measure multiple, non-critical sample streams using a sequencer and a single analyzer. Our degas mini-panels measure conductivity of corrosive anions after eliminating carbon dioxide.

Sample Sequencing
For more complex instruments measuring parameters such as sodium and silica, multiple sample stream sequencing to a single analyzer can be desirable. To achieve rapid contamination detection at reasonable cost, the right balance must be achieved between the response time of the analyzer, the time interval for measuring each sample, and the number of sample streams. The METTLER TOLEDO Thornton SQ148 Sequencer provides the flexibility to set individual switching times for two to eight samples with a convenient touchscreen interface.

Degassed Cation Conductivity
To distinguish the types of contaminants in a sample, the METTLER TOLEDO Thornton degassed cation conductivity system eliminates carbon dioxide from the sample. This allows accurate measurement of the conductivity of the remaining corrosive anions, mainly chlorides and sulfates. The advanced degassifier includes a thermal safety shut-off and energy-saving counter-current heat exchanger.

Degassed Cation Conductivity Panel

- Monitor corrosive anions in water-stream cycles
- Fully automated operation with safety shut-off

Multi-stream Sequencer

- Up to eight streams
- Trend graphs
- Simple, flexible configuration

Fully Automatic 2300Na Sodium Analyzer

- Minimal operator supervision
- Unattended automatic electrode conditioning and calibration
- Convenient grab sample capability

Low Maintenance 2800Si Silica Analyzer

- Adjustable measurement interval for reagent savings
- Unattended automatic span calibration
- Zero calibration with each measurement

Balance of Plant Water Use
Depends on Reliable Analytics

Cooling water must be monitored closely to minimize scaling, biofouling and corrosion. METTLER TOLEDO Thornton sensors for conductivity, pH and ORP allow reliable measurement in this and other applications with fouling conditions.

In cooling towers, conductivity is used to control blow down of excess mineral build up. Measuring and controlling pH helps prevent scaling and optimizes conditions for water treatment effectiveness. ORP can be used to monitor oxidizing biocides. With METTLER TOLEDO Thornton multi-parameter transmitters and sensors these three measurements are efficiently combined.

METTLER TOLEDO Thornton pH sensors excel in the control of limestone slurry dosing in flue gas desulfurization wet scrubbers. In this process careful control of pH is essential to achieve efficient removal of SOx and obtain satisfactory gypsum slurry properties.

Our robust pH sensors are also widely used in wastewater treatment for reliable neutralization control.

Other applications such as generator stator cooling present challenges in maintenance of sensors while minimizing corrosion. Challenges that our sensors and automated cleaning systems easily meet.

Measurement Parameters

- Conductivity
- pH/ORP
- Dissolved oxygen

One and Two Channel M300 Transmitter

- Multi-parameter capability reduces inventory
- Plug and Measure simplicity with ISM for rapid start up

Compact pH/ORP Sensors

- Durable pH sensors provide long life under extreme conditions
- pH and ORP measurement with a single probe
- Measurement electronics in the sensor results in higher accuracy and enables predictive diagnostics

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Chemical Resistant 4-Electrode Conductivity Sensors

- High range measurement for deionizer regeneration
- Controls accurate acid/caustic dilution
- Enables direct concentration readout

Robust Boiler Conductivity Sensor

- High temperature/pressure ratings for un-cooled samples
- Suitable for auxiliary boiler blowdown and other modest hot samples
- Wide range temperature compensation

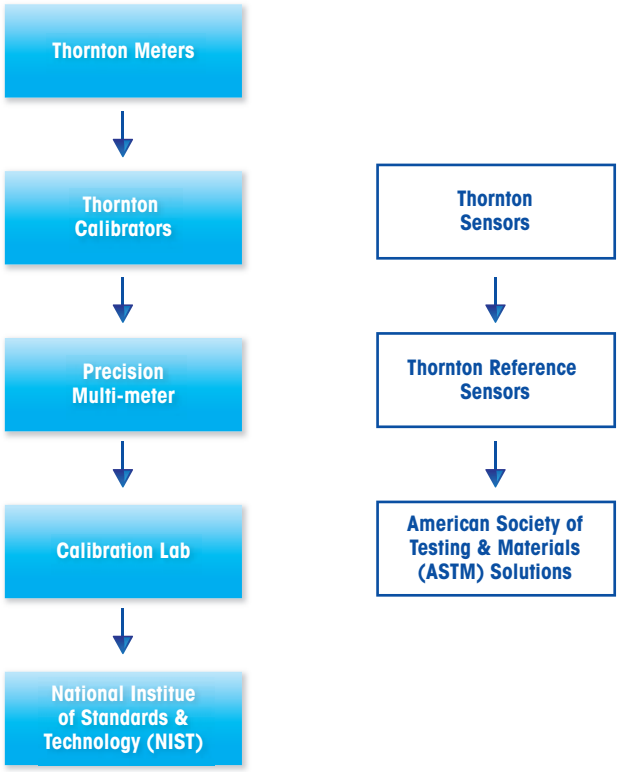
Product Service Offerings
for End Users and Project Engineers

METTLER TOLEDO embraces the complete spectrum of service offerings ranging from product selection guidance, to installation and service contracts.

A Wide Spectrum of Services

We offer comprehensive services from product consultation and application support to installation and after market service contracts. Our sales consultants and high level of technical service capabilities have established METTLER TOLEDO as a competent partner for our global users across the world. Many leading manufacturing companies rely on our expertise and long-standing experience to leverage their maintenance programs.

Traceability Lineage

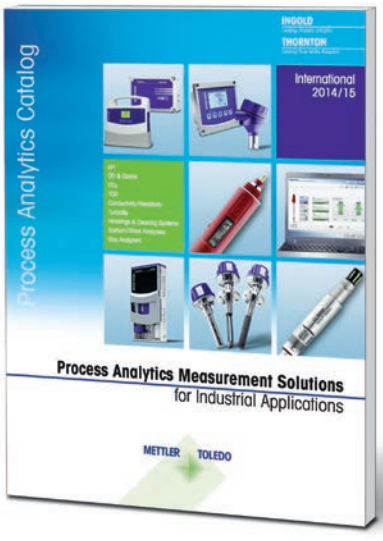


www.mt.com/service

Global Reach
Based from several global production sites, with more than 40 market organizations and many more international sales offices, METTLER TOLEDO maintains a worldwide distribution and service network to support our global customer base.

Superior Application Support
Consultative applications support saves time and money. We offer detailed technical product documentation together with local support during specification, installation and commissioning, contributing to on-schedule project realization.

Superior Services
- Repair at service depot
- Sensor refurbishment
- Installation/commissioning
- Training/seminars/webinars
- Maintenance contracts
- Factory re-calibration
- On-site qualification/verification
- Quality documentation
- Validation support
- Support in compiling SOPs



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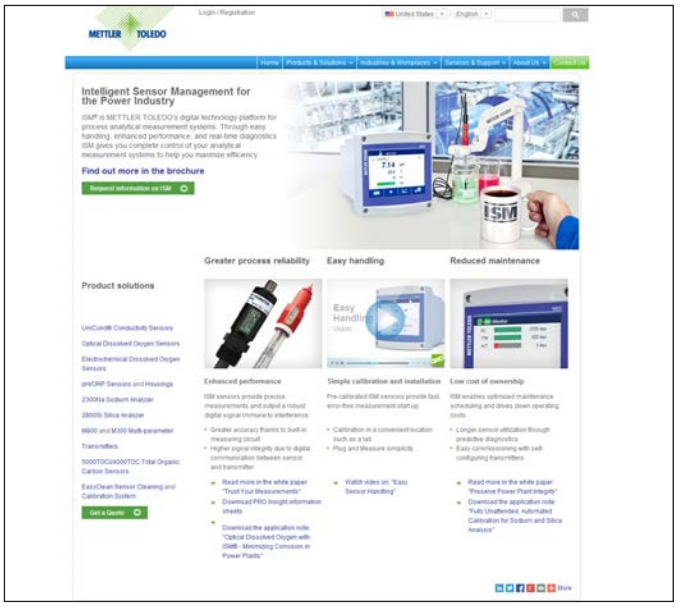
Power Competence Center

The Latest News on Applications and Products



Visit us online to discover how METTLER TOLEDO products and solutions can improve measurements in your plant.

- product information
- white papers
- application notes
- on-demand webinars
- videos

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