

AutoChem



Enabling Tools for
Chemical Synthesis,
Engineering and PAT



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Addressing Key Industry Challenges

From Research to Manufacturing



METTLER TOLEDO solutions enable the development of a wide range of chemistries in the chemical and bio-pharmaceutical industries. Our enabling technologies and services help companies bring products to market faster, at lower costs and with higher quality.

Early Phase Development

Our synthesis workstations and real-time analytics probes allow chemists to quickly develop new synthetic routes, then safely deliver grams to kilograms of materials. In addition, METTLER TOLEDO tools provide early understanding of process scale-up issues that enable scientists to eliminate non-viable candidates early in development – saving money and development cost.

Process Development

The combination of our industry standard RC1e reaction calorimeter, FTIR based *in situ* reaction analysis systems (ReactIR™) and particle characterization tools (FBRM®) enable the chemical, thermodynamic and particle characterization of processes. This increased process knowledge speeds the development of environmentally friendly, safe and robust batch or continuous processes. In addition, the enhanced quality and quantity of process knowledge enables engineers to quickly scale-up processes while eliminating scale-up failures.

Scale and Manufacturing

METTLER TOLEDO Process Analytical Technology (PAT) tools ensure that the process is within boundary conditions, eliminating the risk of batch failures and ensuring the process delivers higher yields at lower cost. Furthermore, our PAT systems allow customers to realize the benefits of Quality by Design (QbD) through the transfer of more robust, lower cost commercial processes to manufacturing.

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Synthesis Workstations

Round bottom flasks, heating mantles, ice baths and cryostats are eliminated. Experimental data is captured to provide enhanced reaction understanding.



Reaction Analysis

ReactIR™ FTIR based systems provide real-time composition analysis allowing the monitoring of key reaction species *in situ* – eliminating the need for grab sampling.



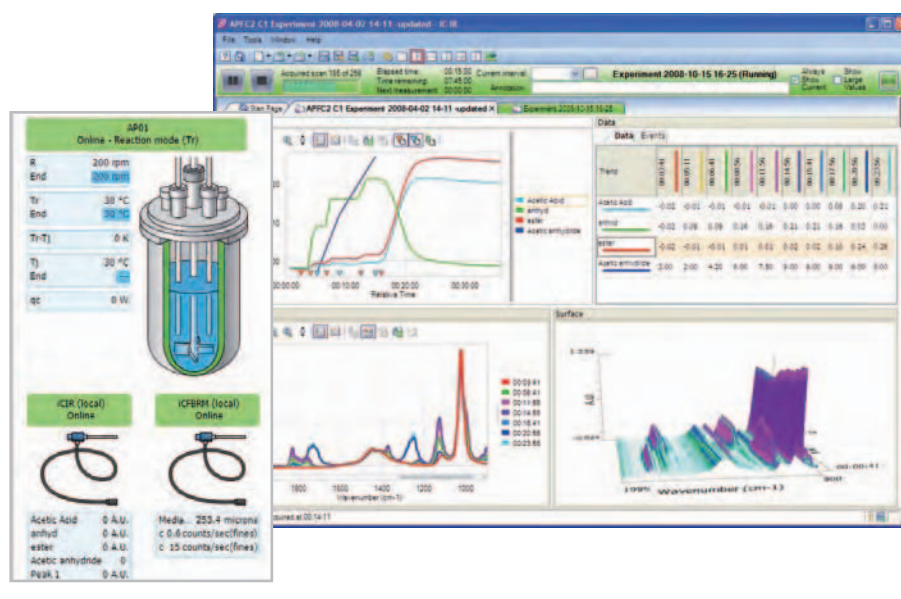
Particle Characterization

FBRM® and PVM® systems optimize crystallization and particulate process development by understanding particle dimension and shape in process.



Simply Powerful Software

iC software integrates the entire experimental workflow making it simple to visualize, interpret and report results. A unified approach supports lab to plant applications for spectroscopy, particle system characterization, precise reactor control and calorimetry. In each iC product, powerful algorithms and graphical representations are combined with a simple user interface enabling scientists to gain deeper process understanding with less effort.



The Complete Solution to Facilitate Improved Process R&D

With thousands of installations across the pharmaceutical, chemical, and polymer industries worldwide, METTLER TOLEDO synthesis workstations, reaction calorimeters, *in situ* reaction analysis tools, and particle system characterization instruments are considered industry standard for enabling the development of safe, robust, commercially viable chemical processes.

ReactIR™ 15/45m Reaction Analysis Systems



ReactIR™ is a real-time, *in situ* mid-infrared based reaction analysis system designed to study reactions without disturbing chemistry. ReactIR™ is used to study reaction progression, giving specific information about reaction initiation, conversion, intermediates, and endpoint. The comprehensive nature of the data makes it ideal for kinetics analysis and the specificity of the information facilitates the elucidation of reaction mechanism and pathway.

RC1e Reaction Calorimetry in Systems



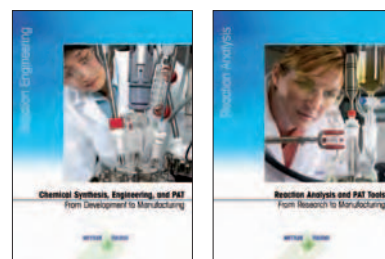
The combination of RC1e and RTCal™ is a leading edge technology that provides easy access to heat flow data in real time without calibrations. It enables chemists and engineers to quickly design economical, robust and safe processes by obtaining heat flow data instantly, making adjustments to the actual chemistry in real time to optimize reaction and process parameters.



Gain a Deeper Insight into Chemistry

By studying reaction progress, initiation, conversion, intermediates and endpoint, ReactIR™ allows the scientist to quickly optimize reaction performance.

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Configuration

Model	Environment	Application Area
ReactIR™ 15	Lab	Synthetic Chemistry
ReactIR™ 45m	Lab	Synthetic Chemistry, Chemical Development, Kinetics, Qualitative Analysis
FlowIR™	Lab	Optimization and Control of Flow Chemistry
ReactIR™ 247	Production	Process Monitoring
ReactIR™ 45P	Production	Scale-up, Campaigns, Process Transfer
RC1e/RC1su	Lab/Pilot Lab/Small Scale Production	Process Development, Process Optimization, Scale-up, Process Safety
RTCal™	Lab	Polymerizations, Process Optimization, Process Chemistry

Innovative Tools for Organic Synthesis

Modern Methods of Working

The unique challenges that scientists in industry face mean they are looking to change the way they work. Even though chemical synthesis has remained largely unchanged for a long period of time, innovation has redefined the way organic syntheses are performed. Synthesis workstations are designed to specifically meet the requirements of synthetic chemists, making them more productive, and helping them to perform better syntheses.

EasyMax™

Replacing Traditionally Used
Round Bottom Flasks



The versatile solid-state thermostat is operated precisely by a simple-to-use touch screen and covers a temperature range from -40 to 180 °C. Reactions can be studied reproducibly in a variety of reactors from 1 to 100 mL. All data and trends are displayed during the course of the experiment and recorded automatically, making the experiment consistently traceable and reproducible.

OptiMax™

Running Experiments at the
Touch of a Button



OptiMax™ is designed as a self-sufficient walk up workstation which doesn't require an additional cryostat. The various reactors are fast to set up, operate accurately and reproducibly, and can be run unattended, safely providing better quality products faster. In order to allow comprehensive data interpretation, the data can be imported into the powerful PC software iControl™ or MS-Excel®.

Products and Processes – Right on Time

EasyMax™ and OptiMax™ synthesis workstations provide a simple platform for product and process development functions, enabling scientists to meet the demands of today's global market.

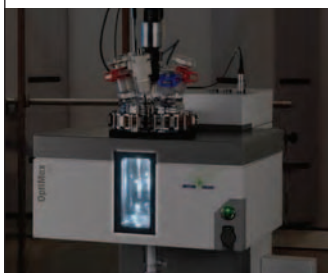
These workstations replace traditional round bottom flasks and jacketed vessels with a versatile system that is easier and faster to use.

No More Ice Baths



Setting the temperature of the reaction is incredibly easy. Temperatures from -40 to 180 °C are easily maintained for the duration of the reaction, with no intervention from the chemist. The innovative heating and cooling technology makes bulky cryostats or ice and oil baths obsolete.

Supervised Reactions



EasyMax™ and OptiMax™ supervise the reaction for you while you do something else that is important. Adding reagents is simple, temperatures are controlled accurately, and the workstation logs all reaction events so nothing is ever missed anymore when the chemist is not present.

Repeatable Syntheses



Repeating a reaction is much easier than before and as easy as cloning and replicating a previous experiment. Also, if two experiments that should produce the same result in fact produce different outcomes, it is easy to compare the two and see where the difference really was.

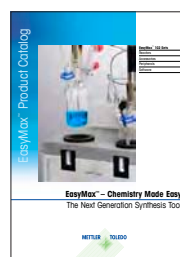
Quality Information



The synthesis workstations ensure accurate, traceable and reproducible experiment execution, eliminate error-prone steps and provide information-rich data. The data obtained helps to support the characterization of the process resulting in a significant reduction of the process variability.

Configuration

Model	Environment	Application Area
EasyMax™	Lab	Synthetic Chemistry, Process Development
OptiMax®	Lab	Synthetic Chemistry, Process Development



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► www.mt.com/easymax
 ► www.mt.com/optimax

Particle Characterization

Measurement for Real-Time Optimization

Focused Beam Reflectance Measurement (FBRM®) and Particle Vision and Measurement (PVM®) technologies provide precise inline measurement of particle dimension, shape and count without sampling. Probe-based instruments measure particles and droplets in gas or liquid suspension at process concentration. FBRM® and PVM® supplies engineers and scientists with real-time information to speed development, maximize process performance, and optimize quality.

G400 Series

Lab Scale FBRM®



The portable small scale FBRM® G400 is ideal for applications in less than 1 liter vessels or small pipelines. G400 can be multiplexed to run simultaneous experiments. Experimental parameters are quickly screened to assess the impact of process conditions on the particle system.

G600 Series

Lab to Plant Scale FBRM®



FBRM® G600 is ideal for 1 to 50,000 liter vessels. G600 allows chemists and engineers to design processes that can scale-up to production providing the desired particle size distribution, yield and purity. Tracking the particles allows processing conditions to be adjusted to ensure optimum cycle time.

C35 Series

Lab to Plant Scale FBRM®



FBRM® C35 monitors real-time changes in particle count and dimension during cohesive wet or dry particle processing. *In situ* measurements enable Quality by Design (QbD) throughout granulation development, scale-up and manufacturing while ensuring the targeted granule size is achieved.

V819 Series

Lab Scale PVM®



PVM® is a probe-based vision tool that provides immediate and critical insight into crystal, particle, and droplet systems. Process changes are quickly identified to aid good decision making regarding the direction of development.

From chemical crystallization to solids flocculation to crude oil/water separation, and emulsion stabilization, FBRM® and PVM® enable engineers and scientists to enhance process performance and control particles in real time.

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Configuration

Model	Technology	Vessel Size	Key Characteristic
Laboratory Solutions			
G400	FBRM®	30mL - 500mL	Portable
G600	FBRM®	500mL - 5L	Results scalable to plant
V819	PVM®	250mL - 5L	In-process video microscopy
C35	FBRM®	5L+	Scraper ensures clean window
Production Solutions			
D600R	FBRM®	1L+	Dip-pipe mountable
D600S/T	FBRM®	1L+	Pipeline installations
D600P	FBRM®	20L+	1m probe length
D600X	FBRM®	1L+	Customizable
C35	FBRM®	5L+	Scraper ensures clean window

Innovative Service Solutions for Reliable Instrument Performance

Researchers and engineers across industry and academia rely on METTLER TOLEDO instruments to provide critical information during investigations. To be successful scientists need to be confident that the equipment works correctly, when it is needed, and the result can be trusted.

METTLER TOLEDO provides a range of service options to prevent instrument downtime, guarantee result quality and ensure regulatory compliance, while reducing the total cost of ownership. Our customized coverage minimizes unexpected costs, improves data collection reliability and reduces the total cost of ownership.

Uptime



Instruments are often subjected to high utilization in mission critical processes. System reliability is maximized through our field service team, help desk, return to factory refurbishment and repair services, and optional value added products.

Performance



Optimize hardware and software performance with comprehensive installation, preventive maintenance and service contract programs. These services are performed by trained METTLER TOLEDO technicians to ensure the system is performing within factory specifications.

Compliance



Meet internal and external compliance standards with optional value added services at the time of installation and throughout the lifecycle of the product. IPac and EQPac qualification services provide peace of mind, internal compliance standards and objective evidence for regulated environments.



Expertise



Our technical experience, market knowledge and global coverage provides dependable support and guidance required. Service specialists will identify, plan and coordinate complex product solutions, workflow integration and installations for on-time and on-budget completion.

Installation and Performance Verification Packages

Professional documentation ensures compliance and process consistency

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