

# RTCal™ – Real Time Calorimetry

## Characterize your Reaction at a Glance

System Requirements		
RC1 <sub>e</sub> ™ High Performance thermostat	with MidTemp range -50 °C to 180 °C (Tr)	
PC	Processor RAM HDD  CD/DVD-ROM drive Operating system Internet Explorer Display resolution	<ul style="list-style-type: none"> <li>- 2 GHz or faster</li> <li>- 2 GB or more</li> <li>- 4 GB free harddrive space for software</li> <li>- ~100 MB free harddrive space per experiment day</li> <li>- Windows XP</li> <li>- IE 6 or higher</li> <li>- 1280 x 1024 (SXGA) or higher</li> </ul>
Packaging		
RTCal™ option ME-51162497	Option for a new RC1 <sub>e</sub> ™	<ul style="list-style-type: none"> <li>- RTCal™ electronic box</li> <li>- Software option RTCal™ for existing users</li> </ul>
RTCal™ upgrade ME-51162498	For users of existing RC1 <sub>e</sub> ™	<ul style="list-style-type: none"> <li>- RTCal™ electronic box</li> <li>- Software option RTCal™ for new systems</li> </ul>
"iControl™" upgrade for "WinRC for RC1 V7.x" ME-51162493	Software upgrade for users with RC1 <sub>e</sub> ™ and "WinRC for RC1 V7.x"	<ul style="list-style-type: none"> <li>- CD/DVD-ROM with "iControl™" software</li> </ul>
"iControl™" upgrade for "WinRC for RC1 V6.x" ME-51162494	Software upgrade for users with RC1 <sub>e</sub> ™ and "WinRC for RC1 V6.x"	<ul style="list-style-type: none"> <li>- CD/DVD-ROM with "iControl™" software</li> </ul>
Available reactors		
AP00-0.5-RTC-3w ME-51162401	<ul style="list-style-type: none"> <li>- 500-mL RTCal™ reactor</li> <li>- Lid of PTFE</li> <li>- Impeller stirrer</li> <li>- Temperature probe (Tr/Trs)</li> <li>- 5 W calibration heater</li> <li>- Adapter of PTFE and stoppers of glass (US &amp; EU standards)</li> <li>- Mounting set</li> </ul>	
AP01-2-RTC ME-51162300	<ul style="list-style-type: none"> <li>- 2-L RTCal™ reactor</li> <li>- Mounting set</li> </ul>	

# Reaction Calorimeters



## RTCal™

Innovation  
Technology  
Efficiency

[www.mt.com/RTCal](http://www.mt.com/RTCal)

For more information

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# RTCal™ – Online Heat Flow Data in Real Time

## An additional technique for the Reaction Calorimeter RC1e™

- Reduces time constraints
- Saves time and resources
- Increases confidence in data
- Gives easy access to calorimetry information

### RTCal™ – The Calorimetry

A novel technique to measure heat flow in real-time that extends the range of application to investigate more complex processes makes the RC1e™ even more versatile.

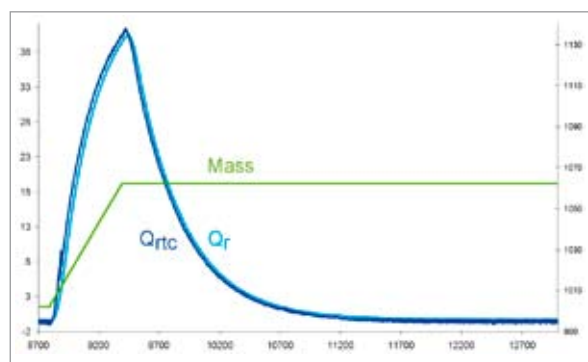


Figure 1 shows the comparison between a traditional heat flow curve and the online RTCal™ signal.

RTCal™ provides:

- real-time calorimetry data without calibration
- heat flux data in parallel to existing heat flow as a powerful source for additional information
- orthogonal data validation through independent heat measurement.

measurements which translate into savings in time, resources and expensive raw material

RTCal™ allows:

- optimization of reactions and process parameters on-line based on heat output
- immediate corrective actions, such as heating rate, dosing rate, pH, etc., during the reaction

### RTCal™ – The Technology

The patented measurement technology RTCal™ is based on heat flux sensors located in the jacket of a double-walled reactor vessel. Vertically and horizontally positioned sensor bands detect the heat flow across the wall of the reactor online and in real time.

The heat flow information is subsequently processed, stored and displayed as Watts or Watts per liter. Depending on the depth of information that you wish to obtain, the system can additionally compute the overall heat of reaction including heat of dosing and accumulation.



### 2-L RTCal™ reactor

High quality sensors guarantee accurate and reproducible heat flow signals.

Experiments with RTCal™ are independent of the properties or the behavior of the reaction mass. Hence, no calibration procedures need to be run before, during or after the reaction which reduces the experiment time substantially compared with traditional methods. The RTCal™ methodology can be run as a sole method on the RC1e™ or complementary to the more traditional heat flow calorimetry.

The enhanced set of information allows you to derive more detailed conclusions and gives you full confidence in your experiment results.

### RTCal™ – The Applications

RTCal™ extends the range of applications considerably to investigate more complex processes, such as polymerizations, optimization and adjustments of processes parameters or reactions where a reactant feed needs to be controlled based on heat flow. Due to short time constants even fast reactions are not limiting.

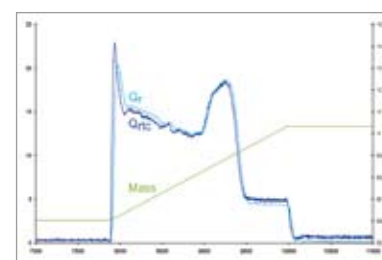


Figure 2

The example in Figure 2 shows the fast reaction of periodate with thiosulfate. While the green curve represents the RTCal™ signal the light blue curve shows the traditional and offline calculated heat flow curve.

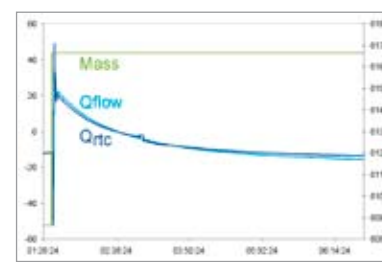


Figure 3

Figure 3 shows a solution polymerization of styrene in toluene. The  $Q_{flow}$  and the  $Q_{rtc}$  signal immediately raise after the addition of the initiator. The slightly different behavior of the two curves is due to the higher sensitivity of  $Q_{rtc}$ .

### RTCal™ – High quality calorimetry data, online and in real time

Applying RTCal™ in a **Chemical Lab** enables chemists to obtain heat data without tedious calibrations and additional training. RTCal™ is a walk-up tool that scans reactions for heat release and provides instantaneous feedback. Therefore immediate corrective actions are possible, saving time, and expensive or scarce chemicals.

Collecting and combining information of reactions from different sources is a common methodology in any **Safety Lab**. RTCal™ can deliver important data to speed-up the investigations and enhances the quality and reliability of the data.

### 500-mL 3-wall RTCal™ reactor

Designed for low starting volumes and good mixing



Heat flow profiles online in real time are an unequivocal advantage for any application in **Process Optimization and Engineering Labs**. The new technology is applicable for real time optimization and direct adjustment of process parameters, but can also act as a PAT (Process Analytical Technology) tool from the laboratory to the plant.

Regardless of whether you are looking for immediate thermal data, searching for specific details within your process, generating data to develop a kinetic model or simply optimizing a process RTCal™ will help to find the answer in an efficient and cost effective manner.