

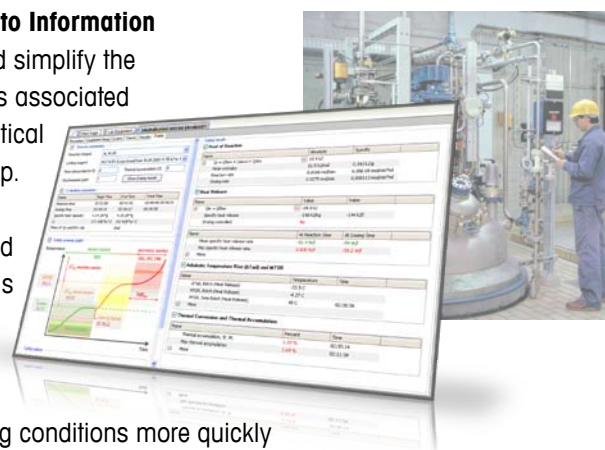
Comprehensive Safety Information in One Click with iC Safety™

Quickly understand the risks of process hazards and get your process right the first time, and in less time.

iC Safety™ is a crucial tool for evaluating the thermal risks of a chemical reaction at industrial scale for use by novice, as well as advanced users. In addition, iC Safety™ summarizes key safety information in an easy-to-understand graphical format and provides access to detailed safety data for expert users.

iC Safety™ – Transforming Data into Information

iC Safety™ is designed to speed and simplify the calculations of thermal safety values associated with complex chemical reactions critical for safe process design and scale-up. It automatically converts reaction calorimetry data into information and safety knowledge providing the basis for correct thermal risk assessment.



The iC Safety™ module:

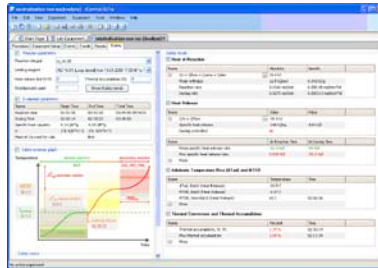
- Helps to understand safe operating conditions more quickly
- Decreases analysis and reporting time
- Provides critical safety data early in the process

iC Safety™ makes potentially hazardous reactions more predictable by providing fundamental safety information, such as:

- Heat of reaction, molar enthalpy
- Heat removal rate for scale-up, reaction rate and dosing rate
- Thermal conversion and thermal accumulation
- Adiabatic temperature rise
- MTSR (Maximum Temperature of Synthesis Reaction)

iC Safety™ – How it Works

Based on heat flow, heat transfer coefficient, specific heat of the reaction mass, and the mass balance, iC Safety™ calculates the safety relevant parameters for the desired reaction.



The heat of reaction, the heat release rate, the specifics of dosing and many more details of the process are conveniently presented in a table.

Heat of Reaction			
Parameter	Absolute	Specific	
$Q_r = Q_{flow} + Q_{react} + Q_{loss}$	20.4 kJ		
Q_{flow}	-31.6 kJ	-305.2 %	
Q_{react}	20.7 kJ	202.2 %	
Q_{loss}	2.79 kJ	26.7 %	
Molar enthalpy	12.5 kJ/mol	0.343 kJ/g	
Reaction rate	0.0166 mol/min	6.89E-05 mol/min*ml	
Change rate	0.0025 mol/min	0.00011 mol/min*ml	

Heat Release			
Parameter	Value	Value	
$Q_r = Q_{flow}$	-24.9 kJ		
Q_{flow}	-25 kJ	100.1 %	
Specific heat release	-140 kJ/g	-144 kJ/g	
Dosing controlled	Yes		

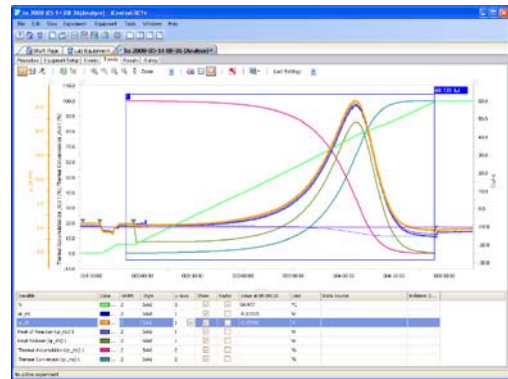
Parameter	At Reaction Time	At Dosing Time
Mean specific heat release rate	-11.4 kJ/g	-54 kJ/g
Max. specific heat release rate	0.008 kJ/g	-24.2 kJ/g
None		

iC Safety™ – Enables you to Characterize the Risk

The severity of a runaway reaction however, is directly linked with the energy of a reaction. Hence, the adiabatic temperature rise, the MTSR (Maximum Temperature of Synthesis Reaction), and subsequent values are important facts provided by iC Safety™.

Understanding accumulation is one of the key questions in the risk assessment of a process.

It can be easily determined by reaction calorimetry in combination with iC Safety™. Subsequently, the maximum accumulation of reactants, the related thermal accumulation, and the thermal conversion are displayed.



Knowing, defining and eliminating the potential hazard triggers, i.e. those conditions that initiate secondary reactions or decomposition reactions leading to a runaway reaction, are essential for an inherently safe process.

iC Safety™ in combination with iControl RC1e™ is an intuitive application that provides a better understanding of the thermal risks of chemical processes and helps solve problems with scale-up, heat transfer and process safety issues.

Mettler-Toledo AutoChem Inc.

7075 Samuel Morse Drive
Columbia, MD 21046, USA
Phone +1-410 910 8500
Fax +1-410 910 8600

Mettler-Toledo AG, AutoChem

Sonnenbergstrasse 74
CH-8603 Schwerzenbach, Switzerland
Phone +41-44 806 77 11
Fax +41-44 806 72 90

Internet www.mt.com/autochem
E-Mail autochem@mt.com

Subject to technical changes.
©09/2008 Mettler-Toledo AG
Printed in Switzerland, ME-51725119
Marketing RC/ALR

www.mt.com/iCSafety

For more information