



Calo2310

A new, universal range of Reaction Calorimeters for Safety Investigations and Scale-Up

On-Line Evaluation			
Power		Heat	
HF	-0,1 W	33,1 kJ	
HB	-1,1 W	27,9 kJ	
Ref	0,0 W		
Cal	0,0 W	34,1 kJ	
mass	635,0 g	cp	2,42 J/g+K
A (t)	0,0440	A (t-1)	0,0440 m ²
U (t)	153,05	U (t-1)	122,75 W/m ²
cp(t)	2,91	cp(t-1)	1,92 J/g+K
Integration ON		Calibration ON	
Reset Values			



Calo 2310 eco

With on-line display of A, U, cp in the Blue Window

Isothermal heat flow Calorimeter, best choice at entry level for safety investigations and Scale-up applications.

Calo 2310 base

With on-line display of output and heat of heat-flow, displays A, U, and cp in the Blue Window

Universally suitable, non-isothermal heat flow Calorimeter with automated „Zero Watt“ Base-line function for experienced user, capable of performing complex assignments.

Calo 2310 pro

With on-line display of output and heat of heat-flow and heat-balance as well as A, U and cp in the Blue Window

Combined heat flow and heat balance Calorimeter with automated „Zero Watt“ Baseline in non-isothermal mode. The professional Calorimeter for the complete range of reaction mechanisms.

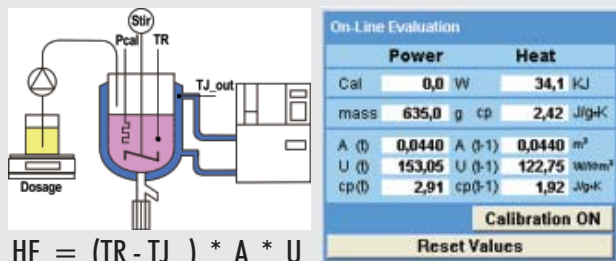
Calo2310 eco

The classical entry level Heat-flow instrument at economical cost



- The entry level heat-flow calorimeter within the isothermal standard range (iso HFC)
- cp Determinations are automatically performed during calibration
- Blue Window display of A, U and cp
- Simple operation combined with offline evaluation using „KaloGraph“
- Optional heat-balance within the reflux condenser

Measuring principles & Blue Window



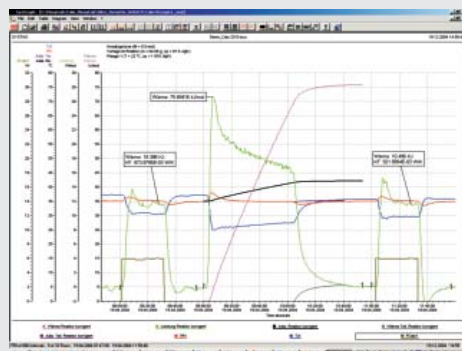
$$HF = \frac{(TR - TJ_{out})}{(T) - (T)} \cdot A \cdot U$$

(W) (°C) (°C) (m²) (W/m²·K)

Data Summary Calo2310 eco

Reactor	Glass, cylindrical, 1l capacity, double jacket, with bottom discharge valve
Operating Range	-20°C to +180°C
Thermostat	Unistat Tango from -40°C to +200°C
Stirrer Speed	40 to 2000 rpm
Dosing Mode	1 x gravimetrically, using membrane pump
Temp.-Resolution	0.007 K (all signals)
Accuracy	4% (isothermal, 5° to 50°C)
OPTIONS	Heat-balance reflux (accuracy 10%), second dosing facility, pH, pH control, pressure/vacuum, distillation, pressure reactor version

Evaluation Calo2310 eco



Shows the SysGraph evaluation software with *KaloGraph* package for manual baseline, calibration, output and heat, with adiabatic increase.

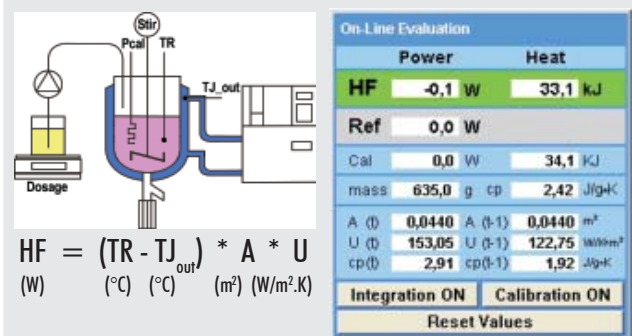
Calo2310 base

The high performance Heat-flow Reaction Calorimeter



- High performance calorimeter, non-isothermal advanced type (n-iso HFC)
- Automated „Zero Watt“ baseline function, instrument supported evaluation
- Measurement can be performed without simultaneous calibration
- Automatic cp determination during calibration
- On-line display of output, heat, A, U and cp
- Optional heat-balance within reflux condenser

Measuring principles & Blue Window



$$HF = \frac{(TR - TJ_{out})}{(T) - (T)} \cdot A \cdot U$$

(W) (°C) (°C) (m²) (W/m²·K)

Data Summary Calo2310 base

Reactor	Glass, cylindrical, 1l capacity, double jacket, with bottom discharge valve, sealed, with safety valve
Operating Range	-20°C to +180°C
Thermostat	Unistat Tango from -40°C to +200°C
Stirrer Speed	40 to 2000 rpm
Dosing Mode	1 x gravimetrically, using membrane pump
Pressure/Vacuum	0 to 1.6 bar _{abs} including control
Temp.-Resolution	0.007 K, HF signal 0.001 K
Accuracy	3% (isothermal, 5° to 50°C)
OPTIONS	Heat balance reflux (accuracy 7%) second dosing facility, pH, pH control, distillation with balance, pressure reactor version

HFC Heat Flow Calorimetry
HBC Heat Balance Calorimetry

**Innovative SYSTAG Reaction Calorimeters
for Safety and Scale-up**

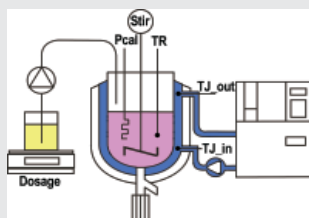
Calo2310 pro

Professional Universal Reaction Calorimeter



- Top class, combined heat-flow and heat-balance calorimeter for non-isothermal applications (n-iso HFC and HBC)
- Using simultaneously two complimentary measuring methods for critical comparisons
- Automated „Zero Watt“ baseline, based on instrument supported evaluation
- Measurement capability even without simultaneous calibration
- cp Determination automatically during calibration
- Blue Window with online display of A, U, cp as well as output and heat, for heat-flow (HF) and heat-balance (HB) each
- Optional heat balance within reflux condenser and combined total balance
- HBC is independent of filling level, viscosity, vortex and heat transit

Measuring principles & Blue Window



$$HB = (T_{J_{in}} - T_{J_{out}}) * cp * r * F$$

(W) (°C) (°C) (J/g.K) (g/ml) (ml/s)

$$HF = (TR - T_{J_{out}}) * A * U$$

(W) (°C) (°C) (m²) (W/m².K)

On-Line Evaluation	
Power	Heat
HF -0,1 W	33,1 kJ
HB -1,1 W	27,9 kJ
Ref 0,0 W	
Cal 0,0 W	34,1 kJ
mass 635,0 g	cp 2,42 J/g.K
A (D) 0,0440	A (I-1) 0,0440 m²
U (D) 153,05	U (I-1) 122,75 W/m².K
cp (D) 2,91	cp (I-1) 1,92 J/g.K
Integration ON	Calibration ON
Reset Values	

Data Summary2310 pro

Reactor	Glass, conical shape, 1l capacity, triple wall, with bottom discharge, tight, with safety valve
Operating Range	-50°C to +180°C
Thermostat	Unistat 380w from -80°C to +200°C
Stirrer Speed	40 to 2000 rpm
Dosing Mode	1 x gravimetrically, using membrane pump
Pressure/Vacuum	0 to 1.6 bar _{abs} including control
Temp.-Resolution	0.007 K, HF and HB signals 0.001 K
Accuracy	HF: 2%, HB: 4% (isothermal, 5° to 50°C)
OPTIONS	Heat balance, reflux (accuracy 5%), second dosing facility, pH, pH control, distillation with balance, pressure reactor.

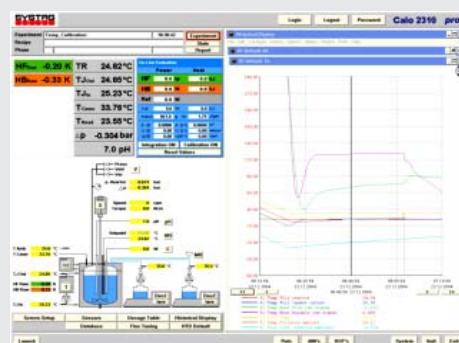
Overview

Depiction of a Calo2310 pro, trolley mounted, with reflux and distillation facilities. Other types of configurations are available.

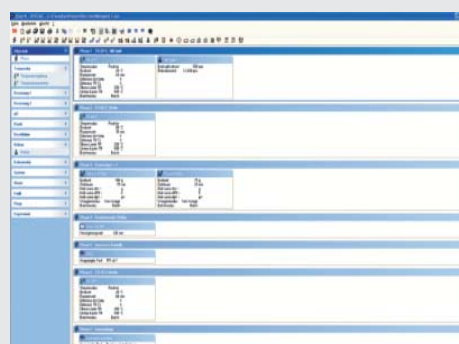


Calo2310 eco or Calo2310 base can be directly assembled into a desk mounted hood (only upper frame structure).

The new FlexySys Surface provides comprehensive operating facilities, whilst reaction progress can be monitored at a glance.

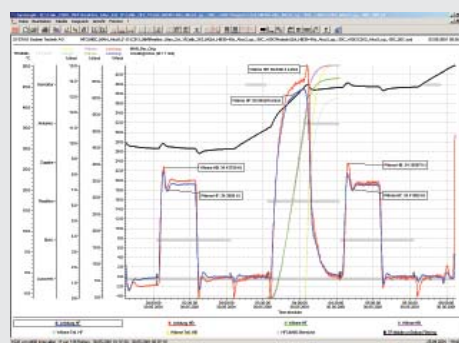


The new Recipe Editor OperX is a drag-and-drop Windows Editor incorporating all advantages of the current Base Operations.



Evaluation Calo2310 base & pro

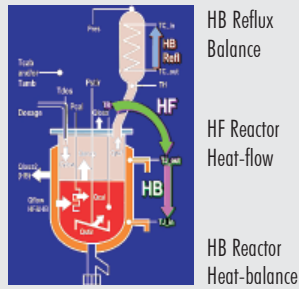
SysGraph evaluation software combined with Calo2000 package for automated „Zero Watt“ baseline function, output and heat of HF, HB and reflux as well as adiabatic increase TR.



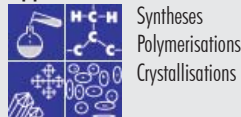
Comparison Table of all Instruments

Calorimetry Specifications

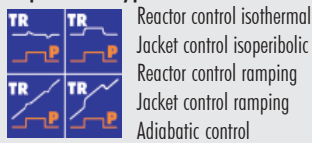
Calorimetric-Methods



Applications



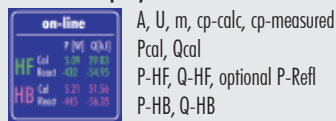
Experiment types



cp Determinations



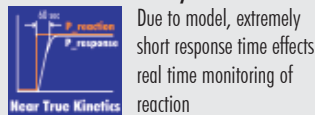
On-line Display



Extremely Dynamic



Excellent Kinetic-Dynamic



● Standard

Calo2310 Family

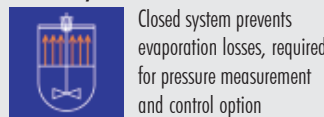
Dosing Error Compensation



Stirrer Correction



Closed System



Lid Heating Facility



CFR 21 part 11



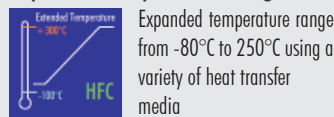
Access Control



Acceptance Certification



Expanded Temperature Range



○ Optional

Instrument Selection List

Reactor Types

Double jacket, glass, 1l, cylindrical
Triple jacket, glass, 1l, cylindrical
Triple jacket, glass 1l, conical
Other shapes or volumes, glass
Steel pressure reactors 60 bar, 1l, cylindrical
Other designs, materials, pressure

Thermostats & Temp. Ranges

Unistat TANGO, -20°C to +180°C
Unistat 380w, -50°C to +180°C
Reactor lid thermostat CC 302-3
Thermostat 390wHT -80°C to +240°C
Lid thermostat 360wHT -60°C to +240°C

Stirrer

2 Ranges 40 to 400 and 200 to 2000 rpm
Basket stirrer, glass
Anchor stirrer, glass
Other designs (propeller etc)

Dosing Equipment

Dosing #1, 1 l/h, membrane pump, balance
Dosing #2, 1 l/h, membrane pump, balance
PTFE Peristaltic pump, 0.6 l/h
Volume dosing by injection pump
Pre-pressurised valve dosing

pH/pX Measuring & Control

pH/pX measuring only
pH/pX control (requires Dosing #2)

Reflux, Reflux Splitter, Distillation

Reflux condenser, w/o HB reflux measurement
Reflux condenser, with HB measurement
Reflux splitter with distillation cooler & balance

Pressure Measurement & Control

Pressure measurement (1.6 bar)
Pressure control: Pressure, venting, vacuum
Other ranges for 10 or 100 bar

Optional Measuring Instruments

Turbidity measurement
Integration of mid- FTIR instruments
Integration of Lasentec instrument

Further Upgrade Options

Calo 2310 eco to
Calo 2310 base to