ALTAMIRA INSTRUMENTS

The First Name in Custom Reactor Systems

µBenchCAT

The µBenchCAT by Altamira Instruments represents a complete, bench-top reactor for catalytic studies. All the components required for either gas-phase or liquid-phase reaction studies are contained in a fully automated compact package. A variety of options makes the µBenchCAT suitable for a wide range of studies.

System Features

- Maximum Operating Temperature: 650°C or 1200°C, depending on reactor material
- Maximum Operating Pressure: Atmospheric, 30 bar, or 100 bar
- Number of Gas Feeds: Up to 6
- Number of Liquid Feeds: 0, 1, or 2
- Reactor Material: Stainless steel, quartz, or Incoloy
- Wetted Materials Include: Stainless Steel, PEEK, Kalrez, Viton, Incoloy, and Quartz
- Isothermal oven housing most process components
- Full automation of process using LabVIEW
- Redundant safety features

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Hardware

Reactor Feed: Up to 6 gases and 2 liquids can be used in the standard configuration of the µBenchCAT. Each gas train incorporates a filter, electronic mass flow controller (MFC), check valve, and positive shut-off valve. The range and gas calibration of each MFC is specified by the customer. Liquids are delivered using high precision HPLC pumps.

Heated Oven: Most process components are housed inside an isothermal oven operated at up to 200°C. The following components are found in the heated oven:

- ***Integral gas preheater and liquid preheater/vaporizer operating at up to 300°C;***
- ***Feed mixer;***
- ***Reactor by-pass valves;***
- ***Reactor furnace with measuring and safety-switch thermocouples;***
- ***Reactor with internal thermocouple;***
- ***Pressure transducer isolator;***
- ***Lines leading to pressure transducer and pressure relief valve mounted outside the oven.***

Condenser: A tube-in-tube condenser is located outside the oven at the outlet of the reactor. A thermocouple is used to monitor the coolant return.

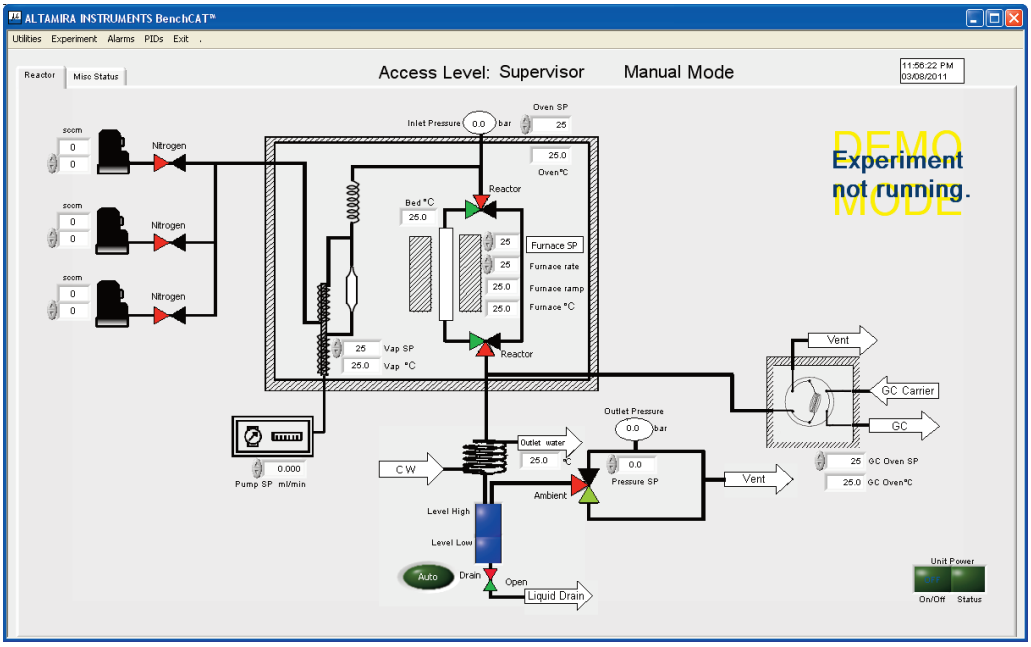
Gas/Liquid Separator: The gas/liquid separator is found downstream of the condenser. Two level switches (high and low) activate an automatic valve and serve to maintain level control.

Pressure Control: Exit pressure is measured with a separate pressure transducer and the pressure is controlled using an automatic tapered needle valve.

Product Sampling Valve: An optional product sampling valve can be used to route an effluent sample to an external analytical device.

Computer Control

The µBenchCAT is fully automated for ease of operation and reliability. It is designed so that it can be run unattended. The operator simply inputs process parameters as a series of steps and schedules a start time. Valve positions, flow rates, temperatures, pressures, and product sampling are controlled by the operating software. Data readback of the process are monitored at a rate specified by the user. The data are saved in a text-delimited format for easy transfer to other programs. The control and data acquisition are performed using a LabVIEW application software specifically written for the µBenchCAT. Complete experiments can be written in minutes and saved for future use.



Main Operation Screen of the µBenchCAT

Connection to External Detectors

The product effluent can be directed to an external detector, such as a gas chromatograph, via an optional heated or unheated sampling valve.

Safety

A number of safety features are built into every µBenchCAT. These include:

- ***Check valves in all gas and liquid feed lines to prevent backflow;***
- ***Software-coded alarms that monitor temperatures and pressure for possible excursions. These alarms are based on the equipment safety limitations, and are configured by Altamira Instruments;***
- ***User-defined alarm matrix where the user can specify lower and upper limits of process parameters and what actions to take in the event that these limits are reached;***
- ***Hardware over-temperature limit switch for the furnace;***
- ***Firmware-level alarms on all heaters;***
- ***Preset relief valves to prevent over-pressurization;***
- ***Power switch mounted on the front of the instrument to control power output to the instrument in case of an emergency;***
- ***Double fusing in all 220 VAC process equipment.***

Our Expertise

Altamira Instruments was founded by catalyst researchers and has been in business for over a quarter of a century. Our instruments and custom reactors are marketed and supported throughout the world. Altamira's team of scientists and engineers has extensive experience and specialize in the field of catalysis. We work closely with our customers to deliver quality instrumentation.

How to Specify a µBenchCAT

µ-A-B-C-D-E-F-G

A. Number of Gases

B. Number of Liquids

C. Pressure/Temp

D. Reactor OD

E. Reactor Material

F. Gas/Liquid Separator

G. GC Sampling Line

Example: µ-G3-L1-0100-375-S-01-00

A.

Number of Gases	
0	G0
1	G1
2	G2
3	G3
4	G4
5	G5
6	G6

B.

Number of Liquids	
0	L0
1	L1
2	L2

C.

Press (bar)/Temp (^{o}C)	
Atm/1200[1]	0000
30/650[2]	0030
100/650[2]	0100
100/800[3]	1008

D.

Reactor OD (in)	
0.25	250
0.375	375
0.5	500
0.75	750

E.

Reactor Material	
Quartz	Q
Stainless Steel	S
Incoloy 800 HT	I

F.

Gas/Liquid Separator	
No	00
Yes	01

G.

GC Sampling	
None	00
Unheated, after pressure reduction	01
Heated, before G/L separator	02

[1] Must use Quartz reactor
[2] Requires Stainless Steel or Incoloy HT 800 reactor
[3] Must use Incoloy 800 HT reactor