

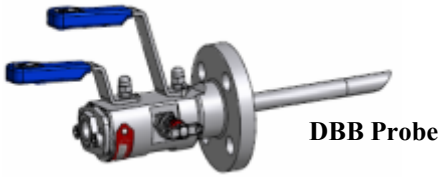
On-Line Process Control Using Modular Fluidic Delivery and Fast Micro Process Gas Chromatography: From Sample Point to the DCS Connection

Sampling Platforms for the Field and Laboratory



Mike Cost – Senior Engineer Analytical Products
Parker Instrumentation Products Division

Analytical Products: The Big Picture (Process/Lab)



Sample Extraction
Parker IPD/IPDE



Sample Transport
Heat Traced Tube Bundles

Sample Conditioning – Parker IntraFlow™

Process/On-Line

Laboratory



DATA !!

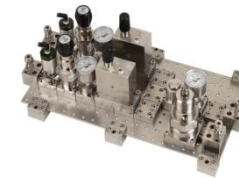


Process analysis requires efficient control of temperature, pressure and flow at all levels of analytical architecture

Key Products:

- Gen II R-Max™ - Analysis
- Vent Master™ - Pressure
- Intraflow™ – Heat/Pressure/Flow
- Intraflow™ – Gas Blending/Calibration

Sample Disposal
Vent Master™



Intraflow™ Gas Blending



Gas Generators



Change Over System

The package = IPD, Veriflo, Porter, IPDE

Parker Analytical Products: Conditioning for Analysis

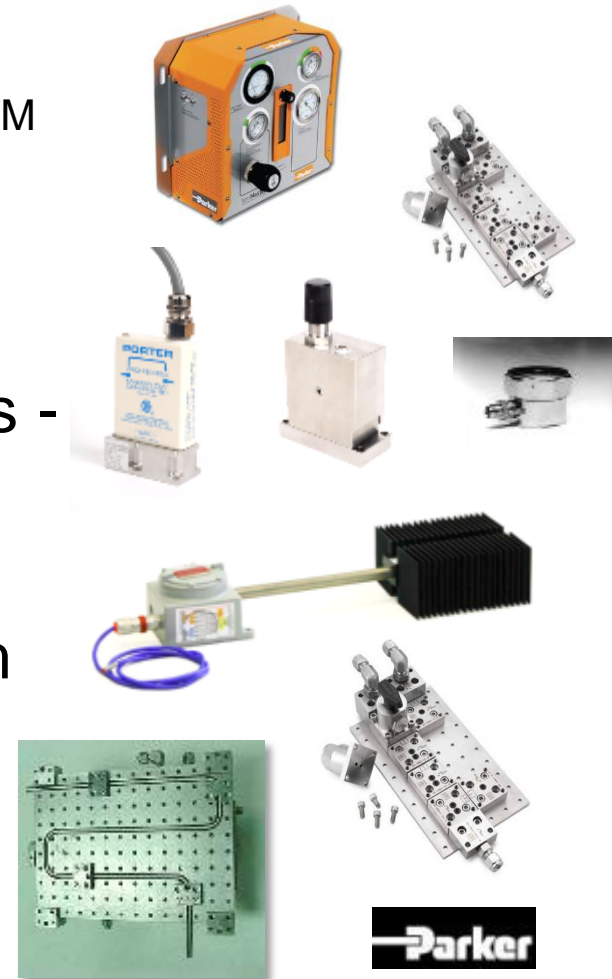
- Most important physical parameters for process/lab analytical measurement: Pressure, Flow and Temperature

How?

Pressure Control – Parker Vent Master™
or *Intraflow™*

Flow Control – Porter Mass Flow,
Volumetric or SC423XL Flow Controllers -
Intraflow™

Temperature Control – Intertec Smart
Blocktherm or Varitherm Heaters, steam
or fluid flow through pegboard, Veriflo
Vaporizing Regulators - *Intraflow™*



Sampling Flow Architecture: Process and the Laboratory



← Sampling →



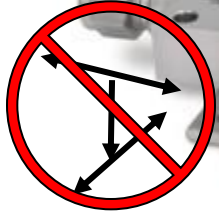
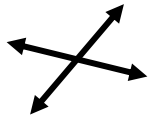
Intraflow™ Parker Modular (NeSSI™) System

**ISA/ANSI SP76.00.02
Compliant**



**Same screw size
throughout**

**Same plane
flowpaths**



**Field connectors
(top or end)**

**Mounting
“Pegboard”**

**Slip-fit intra-
fitting connectors**

Design Driver

- Simplicity Overcomes Limitations



Intraflow™ Fitting



Intraflow™ System

Design Driver

- Simplicity Overcomes Limitations



Parker Tube Fitting



Conventional Sampling™ System

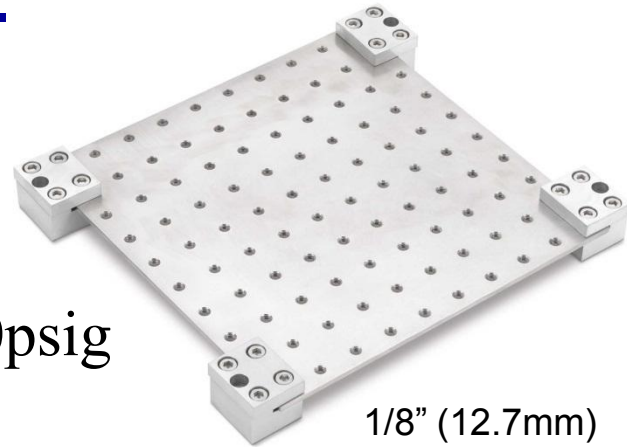


IntraFlow™ Fitting



IntraFlow™ System

Pressure & Temperature Ratings



500psig

1/8" (12.7mm)
316SS

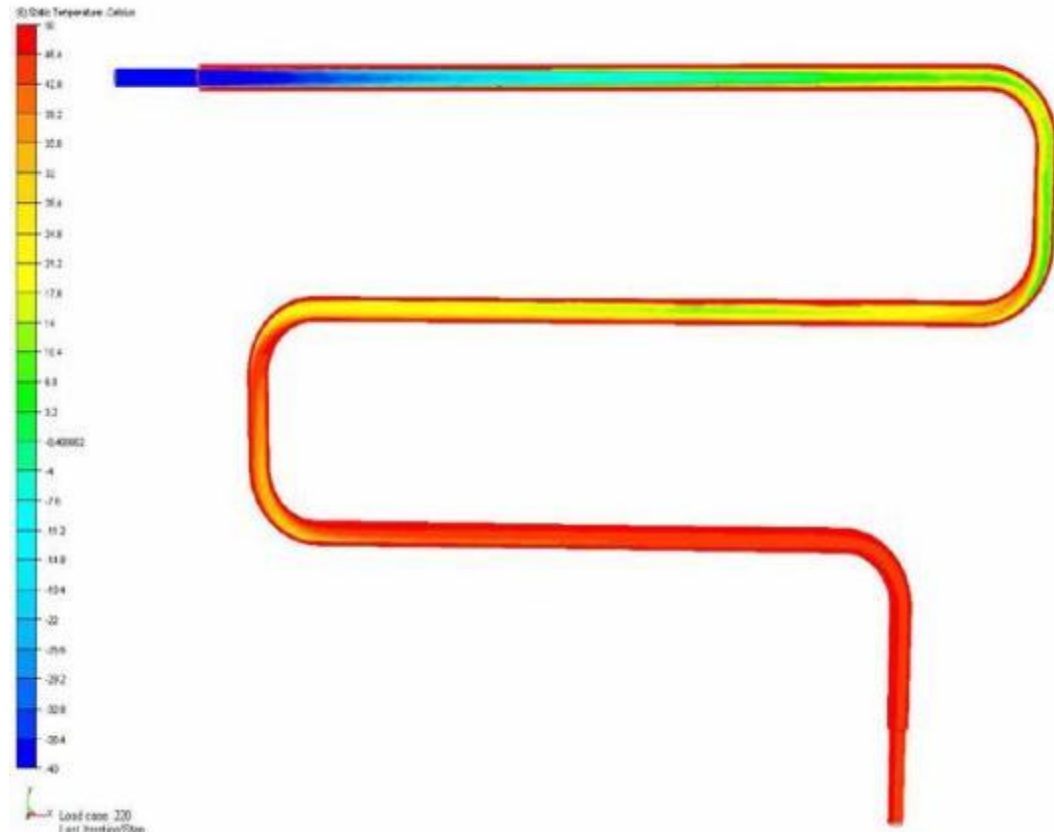
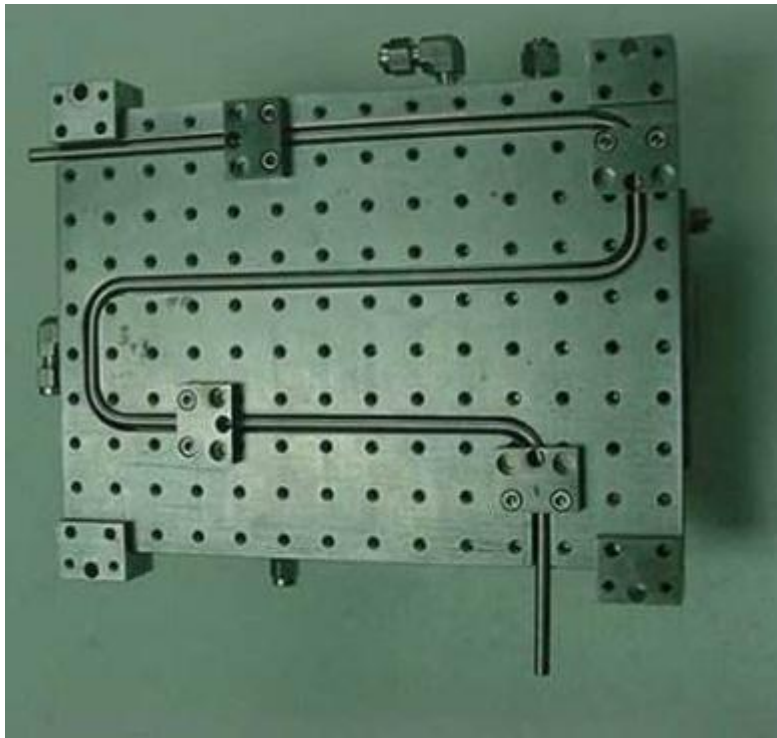
- Fluorocarbon Rubber
-15°F to 400°F (-26°C to 204°C)
- Buna-N Rubber
-30°F to 275°F (-34°C to 135°C)
- Ethylene Propylene Rubber
-70°F to 275°F (-57°C to 135°C)
- Neoprene Rubber
-45°F to 250°F (-43°C to 121°C)
- Highly Fluorinated Fluorocarbon Rubber
-25°F to 200°F (-32°C to 93°C)



2500psig

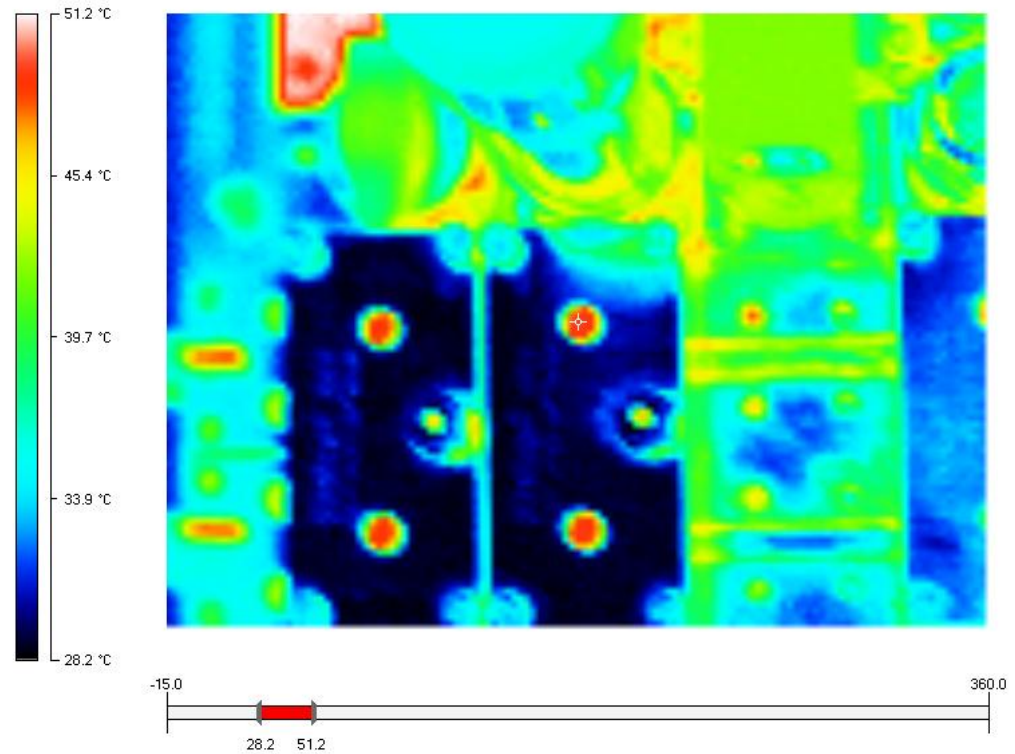
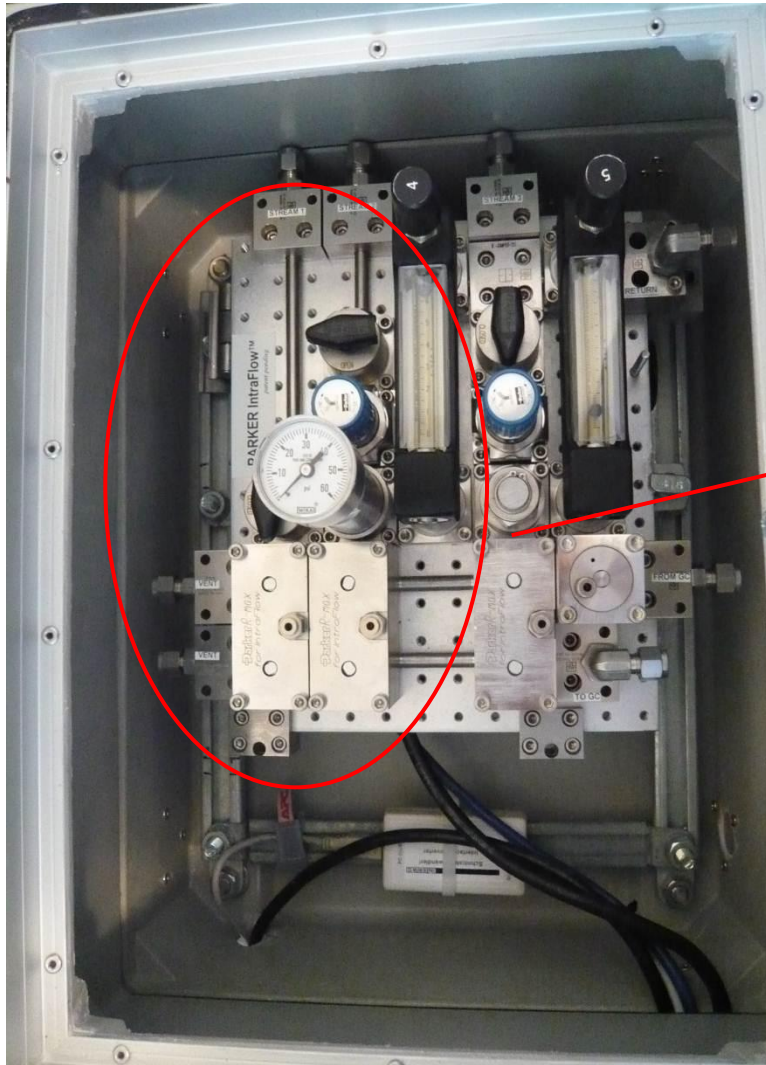
Heated Pegboard:
1/2" (12.7mm)
Aluminum

Pegboard Heating Option: Low Pressure Steam



-40 C air purge supply @ 60psig / 4 bar & 20 SLPM, outlet temp 46 C

Temperature Control: Conductive Heating

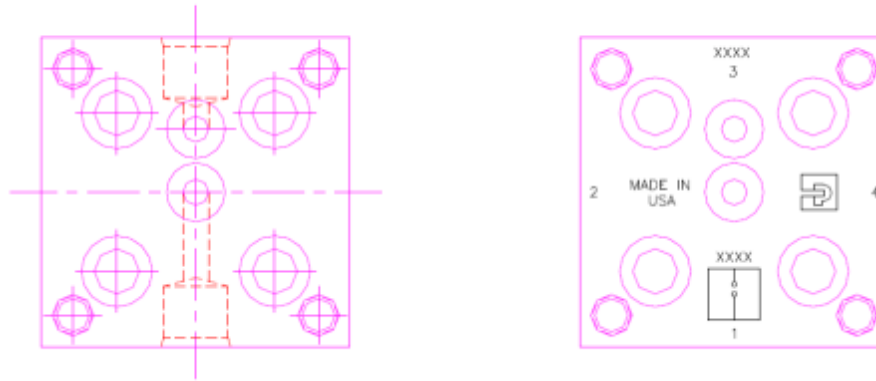
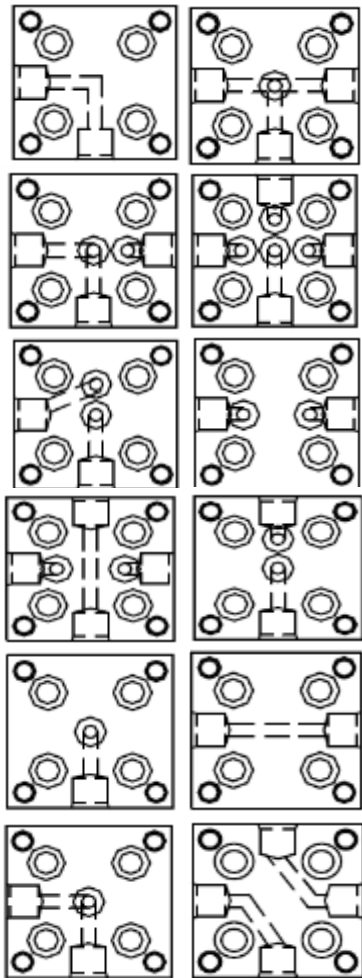


- Temperature setpoint 50°C
- Heat transferred efficiently to components

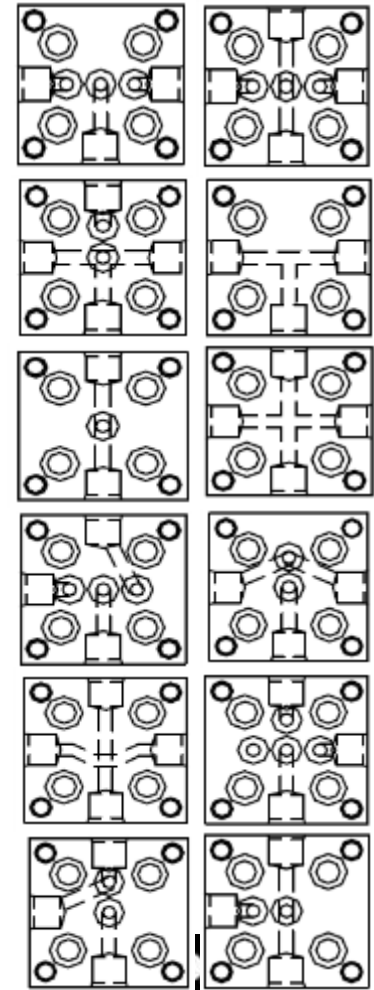
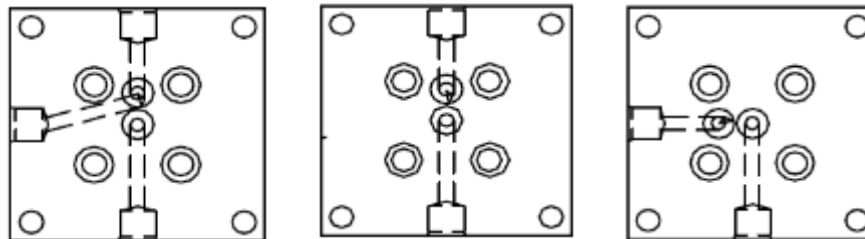
Intraflow™ Substrates/Flowpath Options:

The Library is Has Become Much Larger to Accommodate Laboratory and Process Applications (over 100 flow options)

Part Number Configurator/Generator



IntraFlow™ Fitting

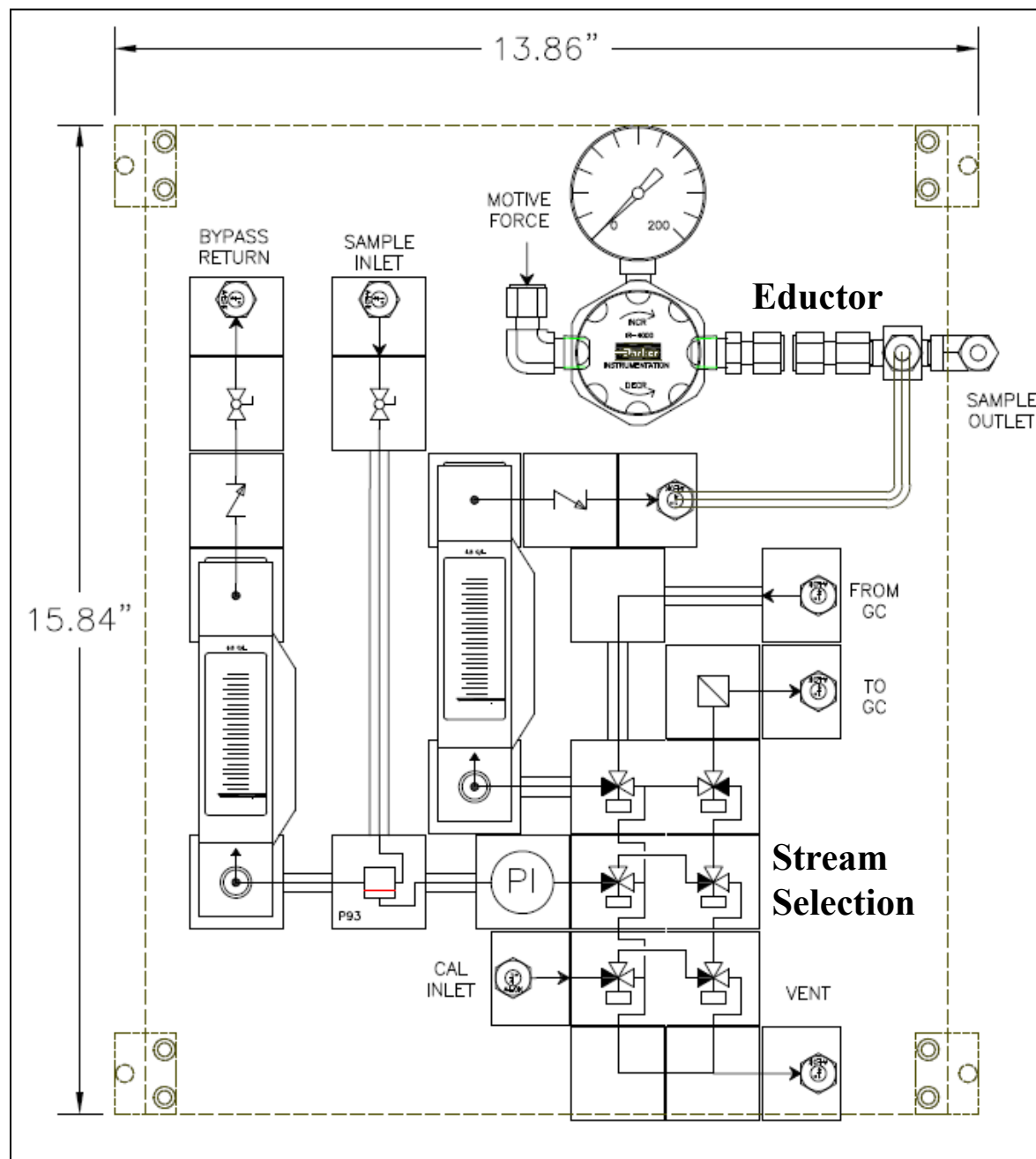


Standard of Flexibility



IntraFlow™ Fitting

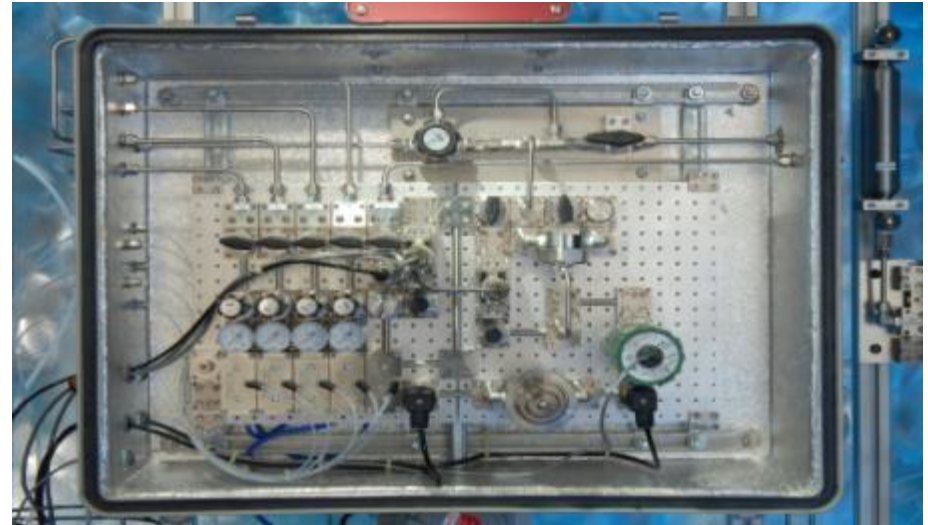
Versatility of Intraflow™ fitting allows multiple options for flow and sample conditioning



Sample System Variability Accommodated

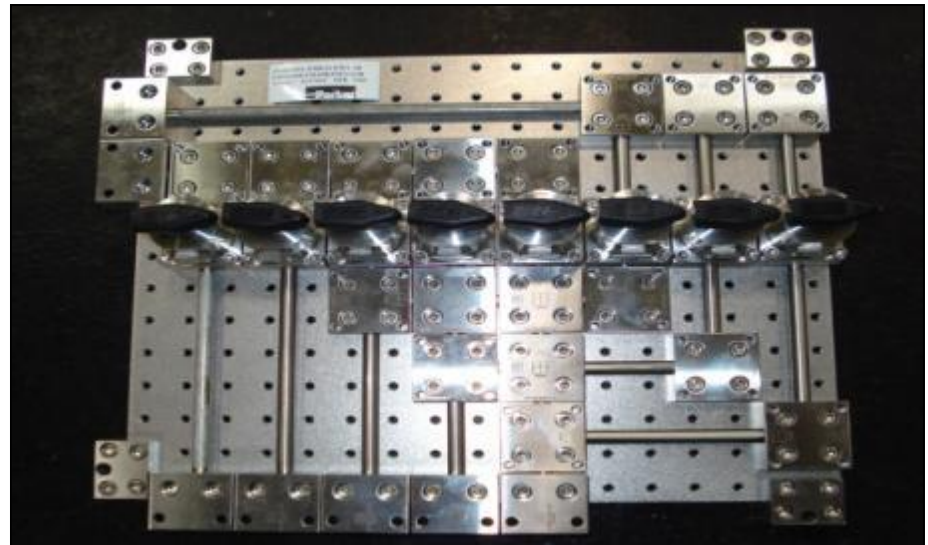
Stack Gas Monitoring:

- O₂ Analyzer
- Eductor
- Flow Monitoring
- Pressure Control/Monitoring
- Sample Stream Selection
- Remote Calibration/Validation



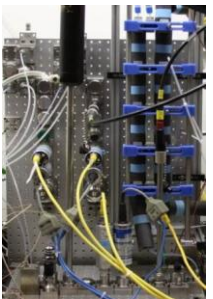
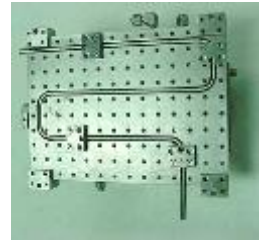
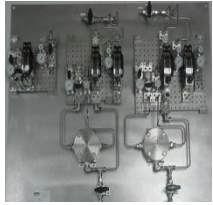
Manual Liquid Sample Control:

- Manual Valve Isolation
- Space Reduction
- Sample Header Implementation



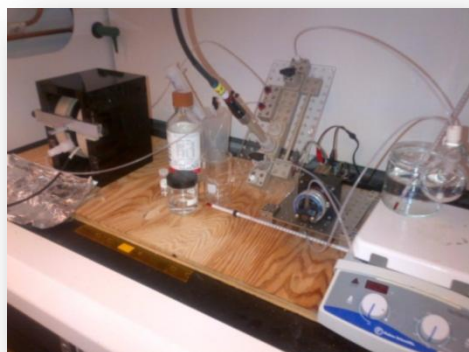
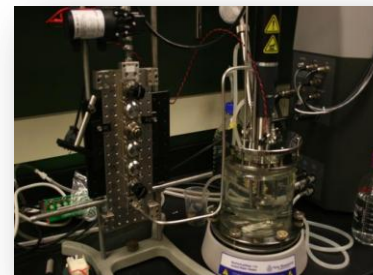
Why Modular Sampling Systems?

- Modularity provides greater flexibility - *multiple flow path options and expansion available; customization*
- Integration of traditional hardware with modular components feasible – *high particulate laden samples*
- Superior temperature control – *heating and cooling*
- Lower cost to operate – *maintenance simplified and system changes are completed with a single device*
- Lower sample stream volumes – *micro-reactors and R&D*
- Faster turnover rates – *close-coupled analysis*

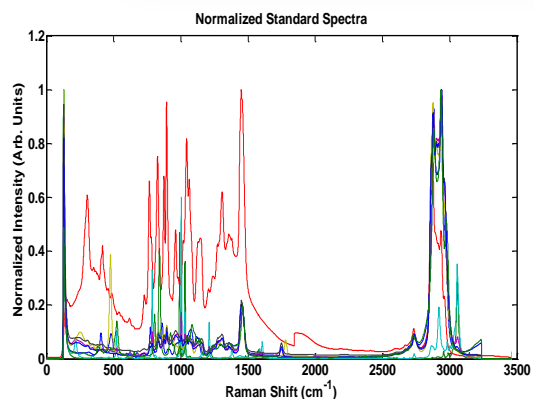


Intraflow™: Applications Versatility

- Pump for liquid recirculation
- Fluidic control hardware
- Sensor Interface
- Temperature Control



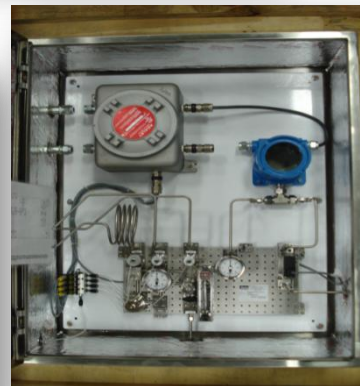
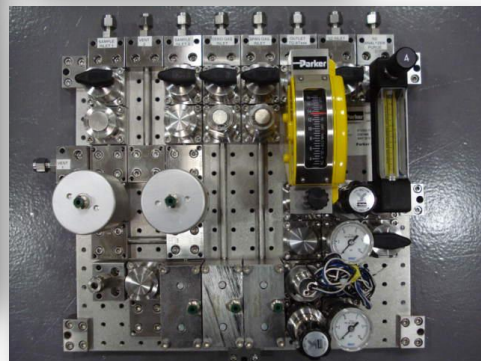
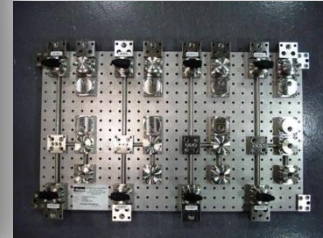
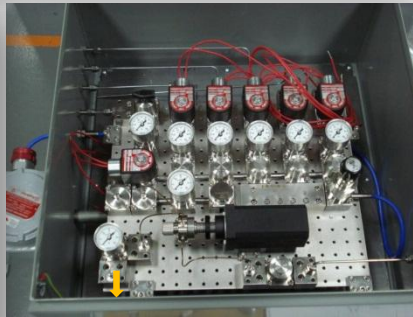
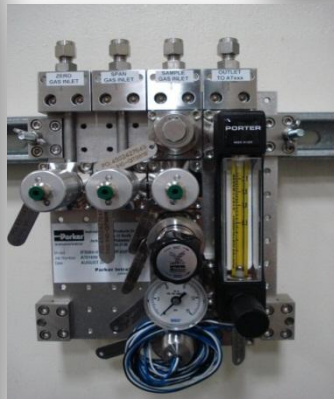
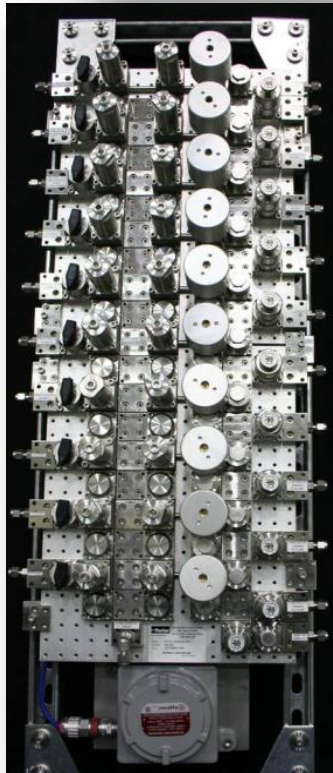
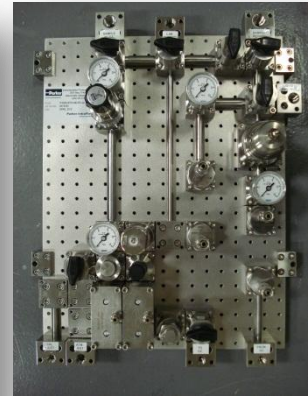
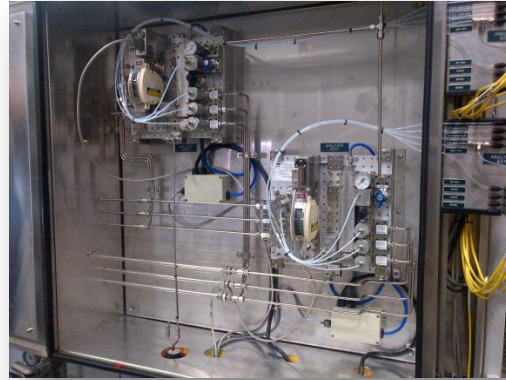
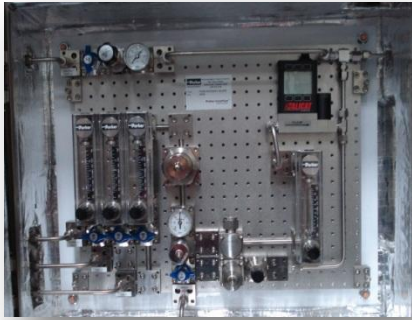
- PEEK substrate and fluidic control hardware
- RAMAN and NMR technology implemented from a single sampling platform
- Standardized platform provides ability to machine specialized sampling systems
- Sampling system allows integration of conventional hardware (i.e. pumps, analytical systems, etc.)



- Intraflow microreactor sample conditioning system
- Analytical platform
- Provided sample introduction and purge
- Portability



Intraflow™: Sampling Applications Review



Intraflow™ and MicroFast GC Analyzer Applications

Applications Detail

- Falcon Calidus GC
- Parker Intraflow™ sampling system
- Carrier gas
- Transportable
- Biotech
- Refinery



MicroGC coupled with Parker Intraflow™ Sample Conditioning System provides realization modularity concepts



Intraflow™ and Transportable Analyzer Applications

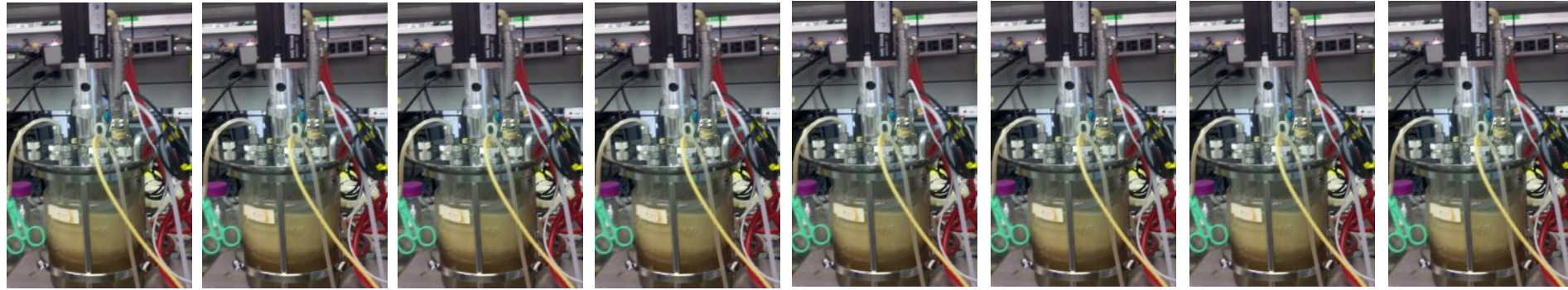
Specifications

- Falcon Analytical Process GC
- Parker Intraflow™ sampling system
- Carrier gas generation or cylinder supply
- Cart mounted for Mobility

Mobile Unit with Support Equipment Mounted - **Bring the Lab to the Field**



Biotech: Fermenter Headspace Analysis

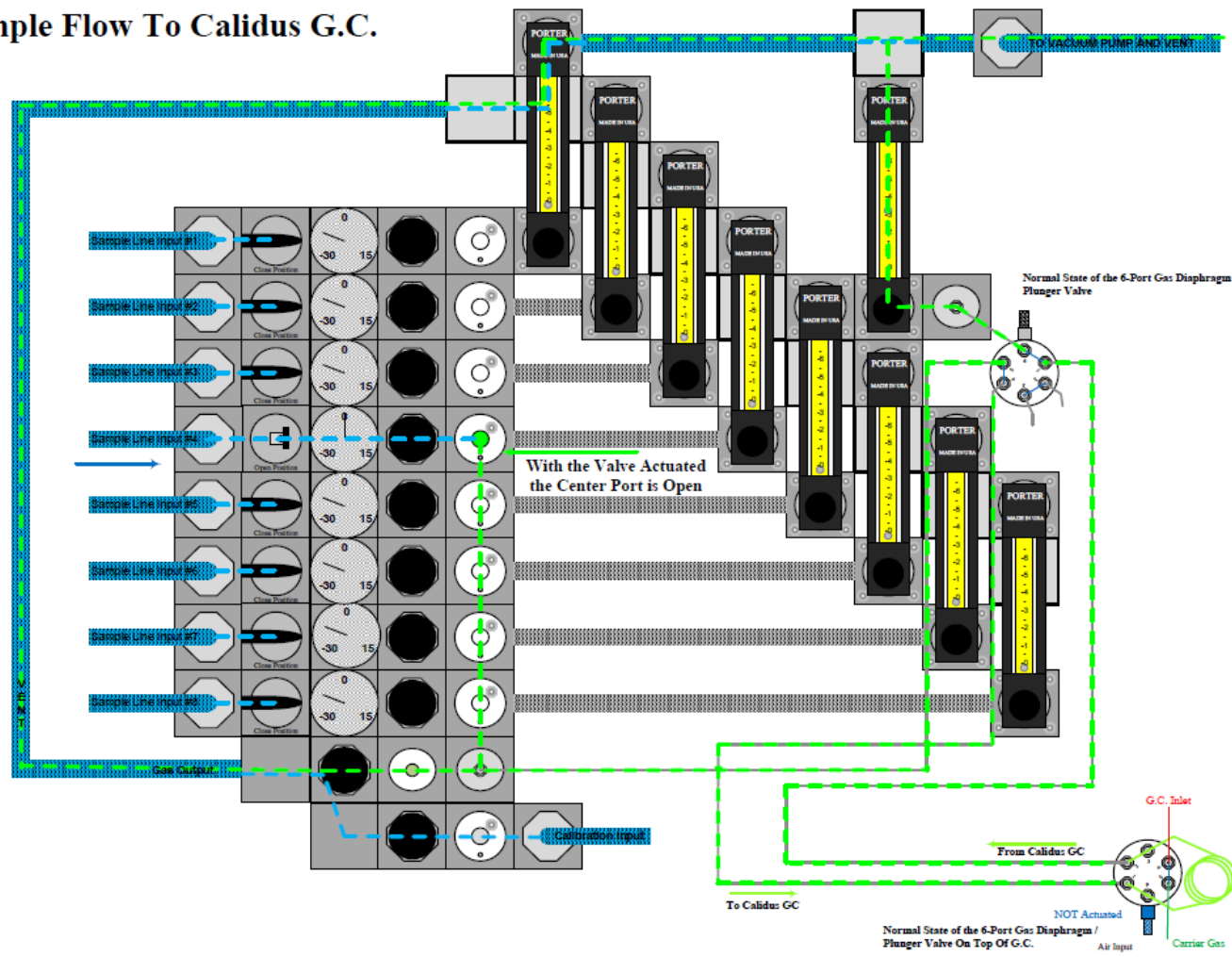
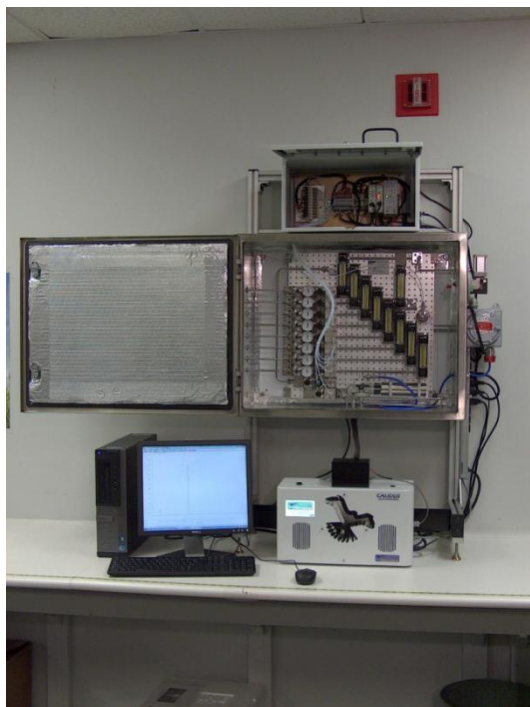


Application Overview:

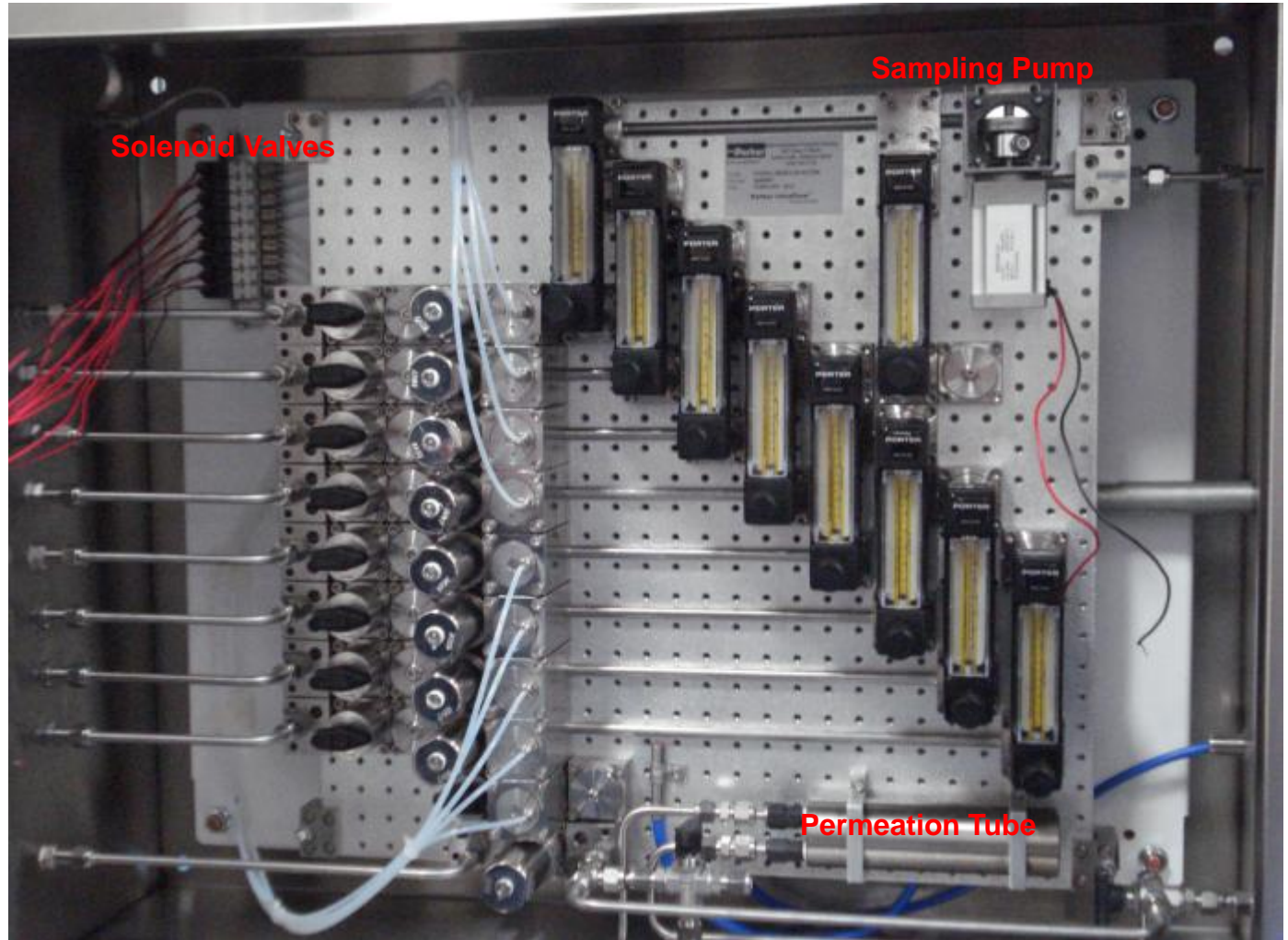
- Multiple stream continuous analysis
- Space constrained area
- Atmospheric pressure sample
- Moisture laden sample

Intraflow™ and Falcon Calidus GC: Flow Architecture

Sample Flow To Calidus G.C.



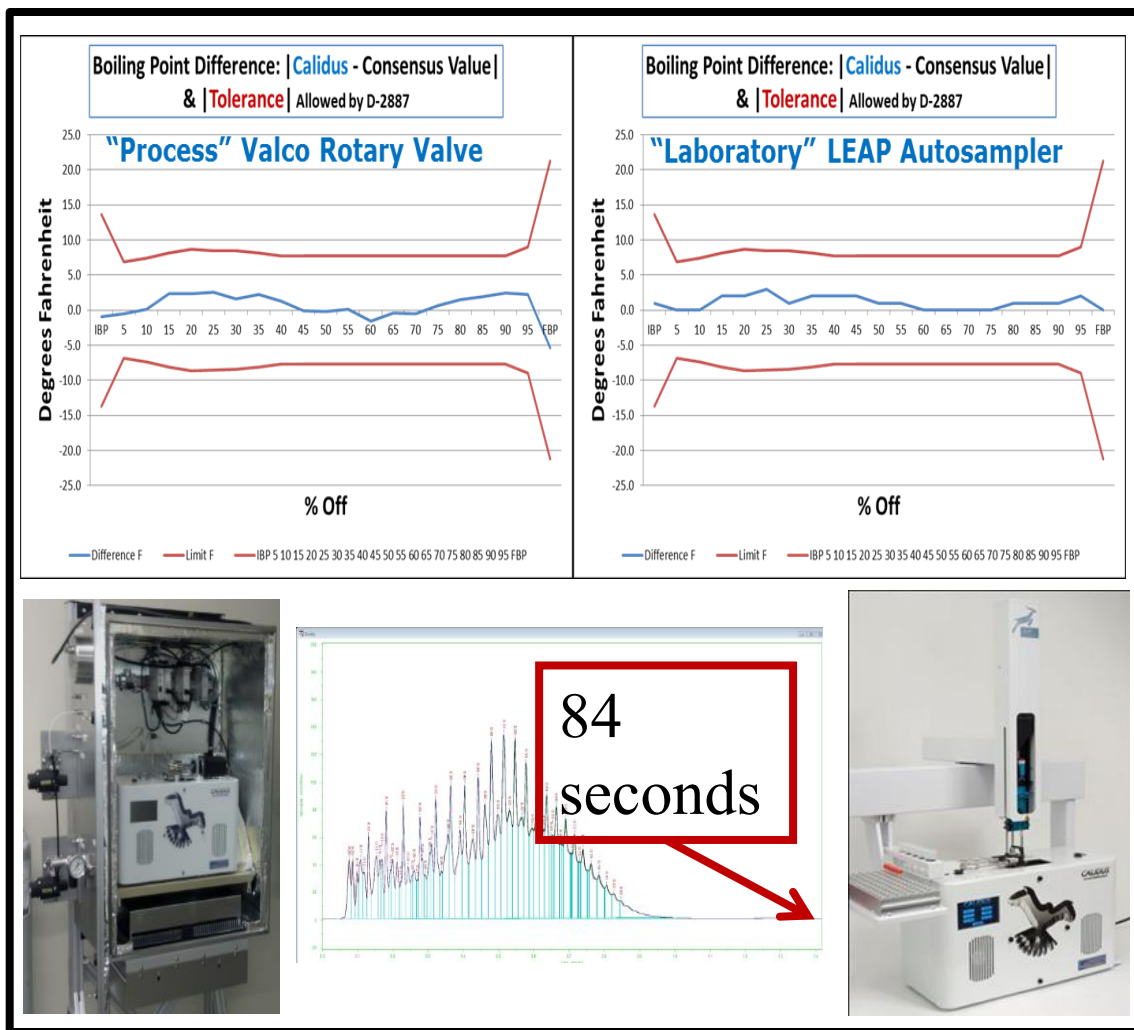
Integrated Intraflow™ Sampling System



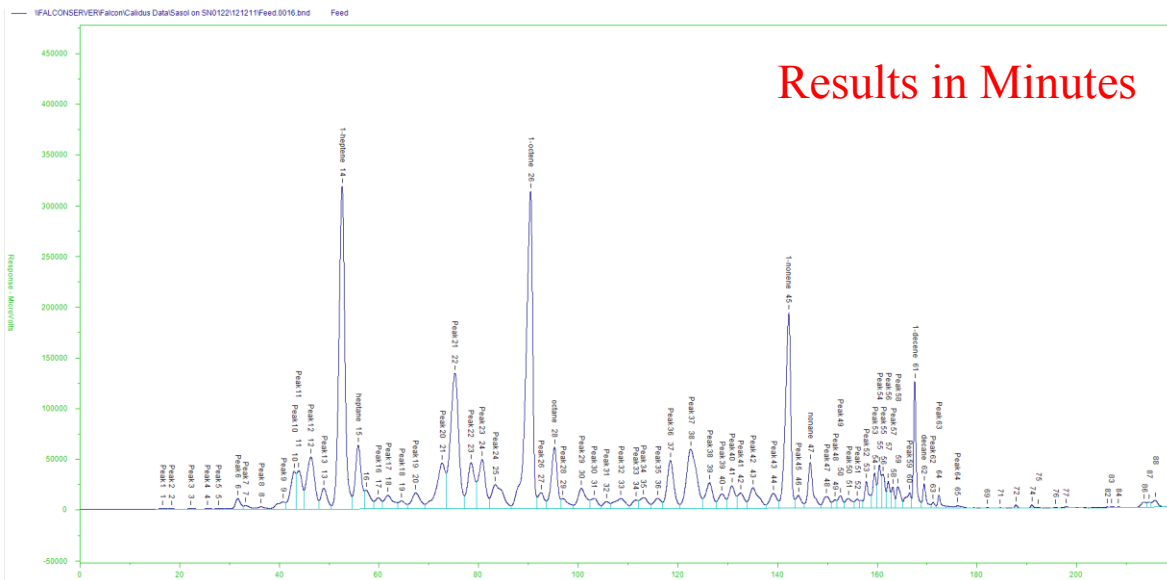
Heated Backplane 60°C



The Results Are... THE SAME regardless of installation site

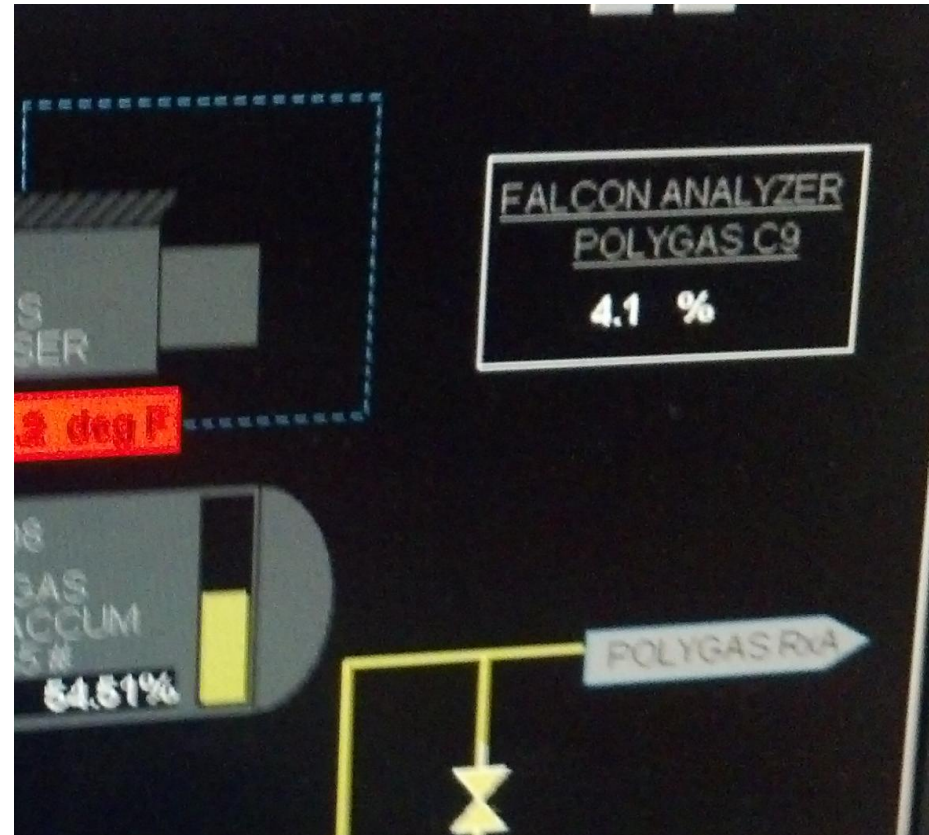


Modular Intraflow NeSSI, Modular Calidus GC, Modular Calidus Process Analyzer

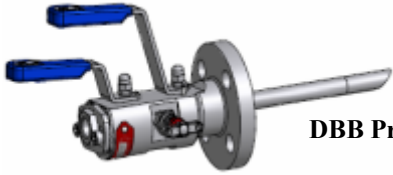


Falcon Analyzer Reporting via MODBUS to DCS

- Polygas C 9
 - Automatic report
 - 4.1%
- Notes
 - All 3 analyzers functioning beautifully
 - Realtime chromatograms on the Calidus PC screen
 - End of run reports show for every GC at run end



Analytical Products: The Big Picture (Process/Lab)



DBB Probe

Sample Extraction
Parker IPD/IPDE



Sample Transport
Heat Traced Tube Bundles



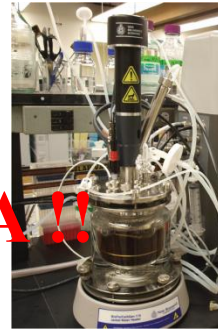
Sample Conditioning – Parker IntraFlow™

Process/On-Line

Laboratory



Process analysis requires efficient control of temperature, pressure and flow at all levels of analytical architecture



DATA !!



Key Products:

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- Vent Master™ - Pressure
- Intraflow™ – Heat/Pressure/Flow
- Intraflow™ – Gas Blending/Calibration

Sample Disposal
Vent Master™



Gas Generators
Change Over System



Parker Systems and Analytics: The Complete Solution



Parker – IPD: Analytical Products Installed Base



SpectraSensors



SERVOMEX

SIEMENS



lyondellbasell



LANXESS
Energizing Chemistry

ABB



GE Energy
TOTAL



ExxonMobil



Uop
A Honeywell Company



bp



Imperial Oil



INEOS
THE WORD FOR CHEMICALS



AIR LIQUIDE



AMGEN

U.S. Steel



KAISER OPTICAL SYSTEMS, SARL
A ROCKWELL COLLINS COMPANY

EASTMAN

YOKOGAWA



Acknowledgments

- Brian Marquadt, Charlie Branham, Michael Roberto, and Thomas Dearing—*Applied Physics Laboratory University of Washington*
- Kin – Tek Laboratories
- CPAC –*University of Washington*
- Falcon Analytical