KEP Technologies

The FLEXI line



YOUR FLEXIBLE ACCESSORIES

setaram
KEP TECHNOLOGIES

APPLICATIONS

KEP Technologies is not simply an instrument company, but a full solution provider.
We do not claim that a single product is suited for all applications and have with our SETARAM brand developed a range of products with different characteristics to more closely meet your demands.
We are confident that with KEP Technologies you will find a solution with the performance you need to get the best understanding of your materials. This being the case no matter which of our below market segments you may work in.



LIFE SCIENCES

API, Excipients, Drug delivery systems, Proteins, Enzymes, Food, Carbohydrates, Fats.
Stability, Polymorphism, Unfolding, Denaturation, Aggregation, Melting, Gel formation, Gelatinization



PROCESS SAFETY

Energetic materials, Propellants, Explosives, Reactants and products of chemical reactions at large scale. Heat capacity, Synthesis reaction, Decomposition, Runaway reaction, Temperature and Pressure rise.



ENERGY & ENVIRONMENT

Oil & Gas, Gas hydrates Stability, Wax crystallization, Biomass, Hydrogen storage materials, Nuclear fuel and wastes, Catalysts & adsorbents, Thermal energy storage materials, Batteries, Gas & vapour sorption, Heat capacity, Thermal stability, Transitions



INORGANIC MATERIALS SCIENCE

Nanomaterials, Metals, Alloys, Ceramics, Glass, Cement, Plaster, Minerals. Sintering, Thermal expansion, Corrosion, Hydration, Transitions, Heat capacity, Thermal stability



ORGANIC MATERIALS SCIENCE

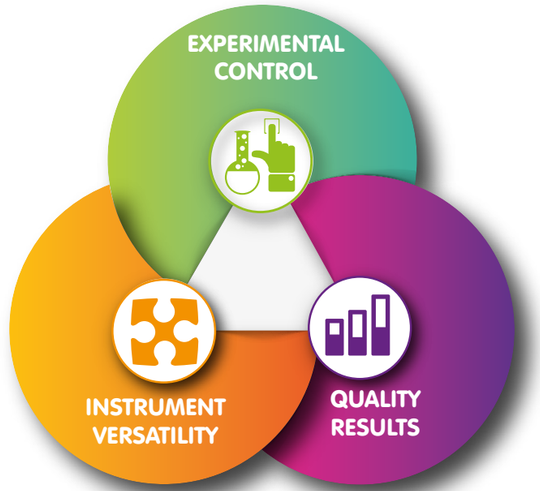
Polymers, Thermoplastics, Thermosets. Glass transition, Oxidation resistance, Heat capacity, Thermal stability, Curing ratio, Transitions

THE KEP TECHNOLOGIES ADVANTAGE

Each FLEXI accessory embodies our "Reimagine Material Characterization" value proposition. It does so by delivering the three core customer benefits of Experimental Control, Instrument Versatility and Quality Results.

We know that solutions that provide these benefits will deliver the highest value to our customers.

In addition to our core customer benefits, we are able to provide customized solutions by harnessing the engineering and project management expertise of our highly skilled organization.



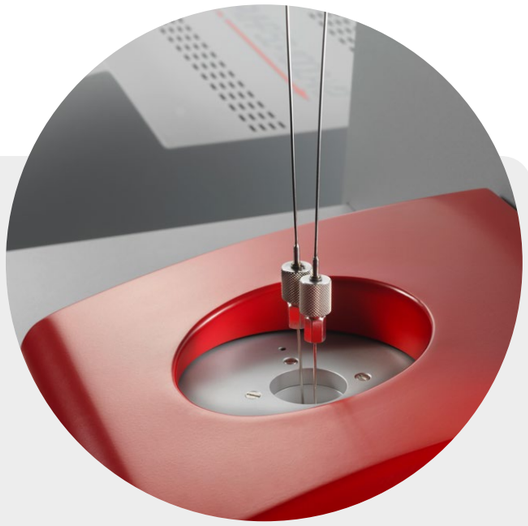
CUSTOMIZED SOLUTIONS

Modular design allows for upgraded and tailored functionality
Access to all previous non-proprietary custom requests
Open access to engineering development team

THE FLEXI LINE

The FLEXI line is a series of flexible, plug-in accessories. They are designed to operate in environments as different as laboratories, workshops or manufacturing lines.

They are easily connected in line or at line to enhance the capabilities of your instrumentation or process.



You can use the FLEXI accessories to control experimental conditions, or for in-situ measurements.

• Experimental conditions control : for temperature, atmosphere, pressure, relative humidity, etc.

• In-situ measurements : for mass variations (gravimetry) or gas analysis.

All our FLEXI accessories have a robust design for reliable operation and the longest serviceable life.

All have simple connection principles. They can be easily connected, disconnected and reconnected again within any procedure.

FLEXI LINE

Our range of accessories for the characterization of materials under a variety of conditions and across wide application ranges.



High Pressure Mass Spectrometer

FLEXI HP MS



High Pressure Hydrogen Delivery System

FLEXI HYCO



High Pressure Control System

FLEXI HP 200



Air Cooled Chiller

FLEXI CHILL

IN SITU MEASUREMENT — EXPERIMENT CONDITION CONTROL

FLEXI BALANCE



Mass Variation Measurement System

FLEXI WET



Wet Gas Generator

FLEXI HP 1000



High Pressure Control System

USER INTERFACE

FLEXI accessories have different levels of control and types of interface. This includes :

- Manual control and visual alarms
- Control panels with display screens
- Signals output for data export
- Software control from a PC or a laptop
- Combinations of two or more of the above

GRAVIMETRIC ANALYSIS
Designed to measure mass loss and uptakes, for solid-gas reactions. Can be coupled to furnaces, climate chambers and other instrumentation.

EGA – EVOLVED GAS ANALYSIS
Combines with any system, even under pressure, to detect and identify gas evolution

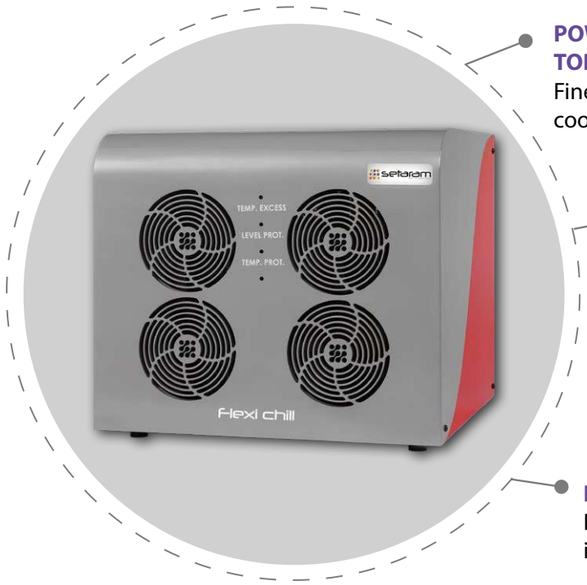
PRESSURE VACUUM
Operates under pressure and/or measures and controls pressure

HUMIDITY
Can be coupled to any laboratory instruments or climate chambers for humidity control

CORROSIVE AND REACTIVE GASES
Able to run in various aggressive atmospheres

TEMPERATURE
Controls temperature of industrial or laboratory systems

FLEXI CHILL



POWERFUL AIR COOLED CHILLER FOR MULTIPLE LABORATORY OR INDUSTRIAL APPLICATIONS

Finest design of heat exchangers and cooling fans for high cooling power capabilities

PLUG&PLAY, SIMPLICITY, EASY SETTINGS

- Effortless use with no temperature settings
- Limited maintenance with no refrigerant circuit, i.e. no leaks and potential environmental problems
- Fast connection to various systems or instrumentation

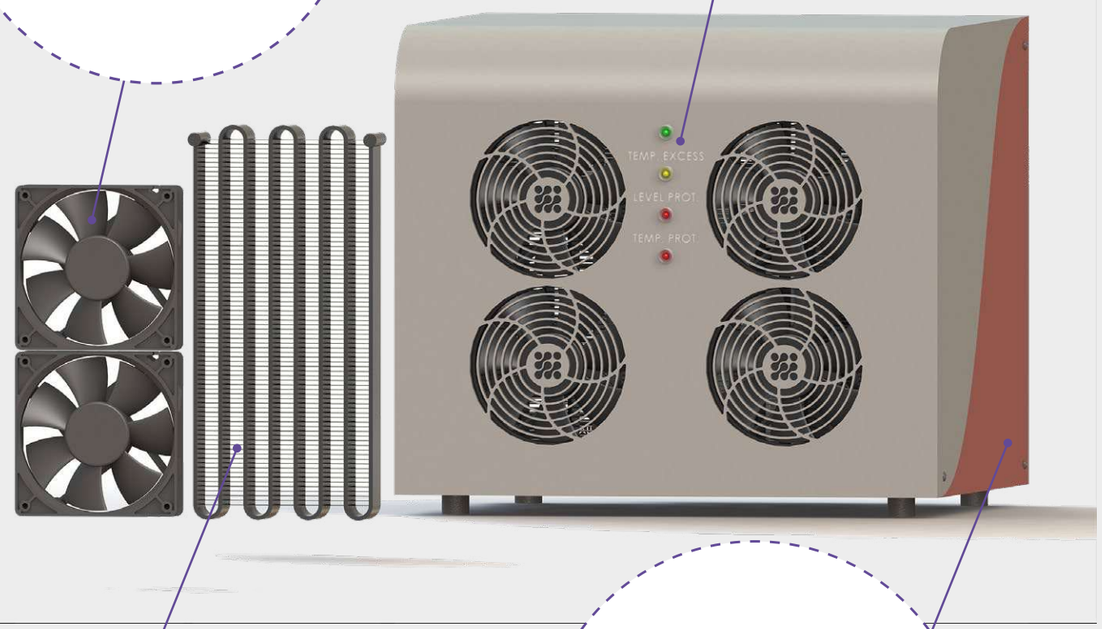
ROBUST DESIGN

Developed in Switzerland by our research and innovation team and CE marked

PERFORMANCE	
Cooling capacity	1800 W at RT = 20°C 1250 W at RT = 30°C
Pump flowrate	up to 4L/min
Pump outlet pressure	Up to 1.5 bar
Tank maximum capacity	5 L
Temperature range	RT to 70°C
GENERAL	
Size (W x D x H)	420 x 420 x 370 mm 16.5 x 16.5 x 14.6 inch
Weight	15 kg 33 lb
Power supply	110 / 230 V 50/60 Hz

Four powerful axial air fans to bring a large air flow over the heat exchanger to enhance the chiller's cooling capacity.

Instrument protection alarms based on liquid's level and temperature
- Temp Excess: visual and sound warning alarms
- Temp Prot: Visual warning and pump switches off.



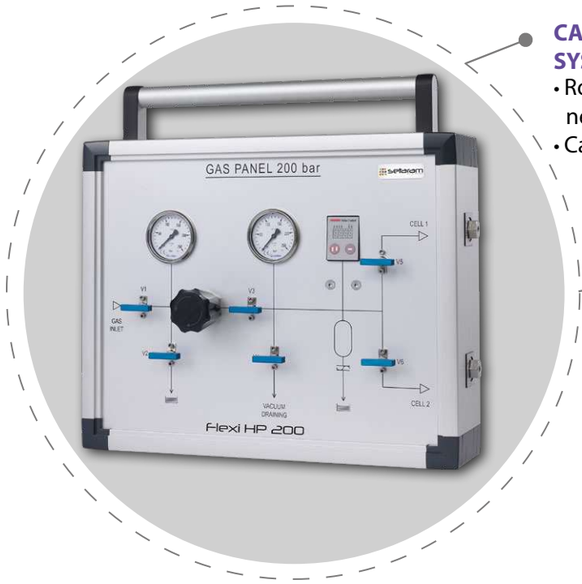
Microchannel based heat exchangers (radiators) expertly designed to ensure the best air / liquid heat exchange.

At the back: 8mm standard inlet and outlet connectors. For easy connection to systems in various fields from **industry** (low power lasers, cutting or engraving machines, welding machines, UV photo printers) to **laboratory** (analytical instruments and other equipment).

The system is based on a centrifugal pump equipped with a brushless motor

Schematics of FLEXI CHILL

FLEXI HP 200



CAPABLE AND ROBUST HIGH PRESSURE CONTROL SYSTEM

- Robust design compatible with most pressure control needs of small systems.
- Can control pressure of two systems simultaneously

PLUG&PLAY, EASY AND SAFE

- Convenient and reusable metallic tubing connection
- Easy operation, manual valves and pressure reducer
- Handle for easy transportation between usage locations
- Equipped with an emergency relief system (rupture disk) to avoid uncontrolled overpressure

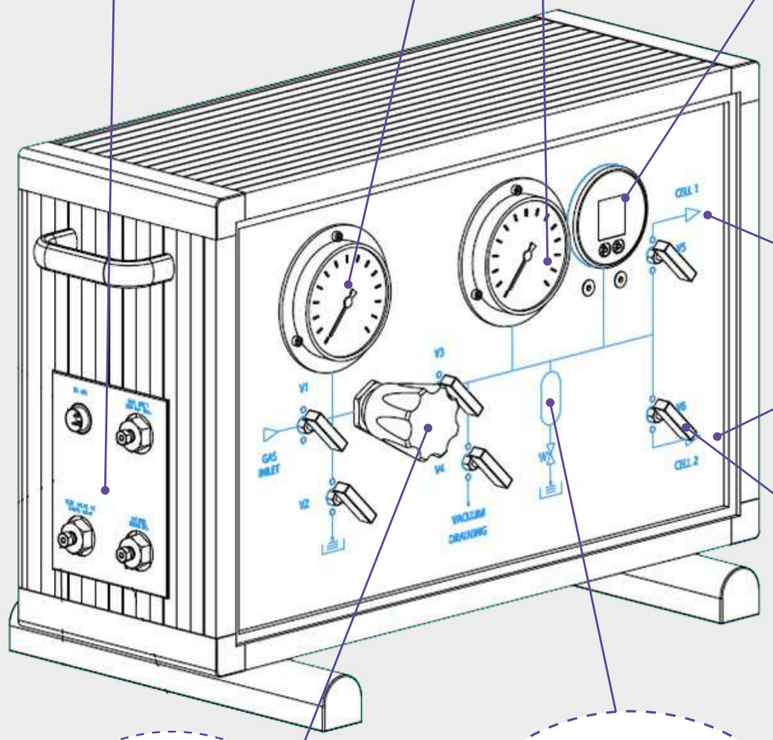
MODE OF OPERATION	
Pressure control	By means of a buffer tank *The outlet pressure is at maximum equal to the inlet pressure*
Control mode	Constant pressure
PERFORMANCE	
Maximum Pressure	200 bar
Pressure display resolution	+/- 0.1 bar
Outlet pressure stability	The outlet pressure stability depends on the tank temperature stability
Gas types	Helium, nitrogen, argon, hydrogen[a], methane[a], carbon dioxide[b], dry hydrogen sulfide
Buffer tank volume	300 ml
GENERAL	
Size (W x D x H)	500 x 200 x 450 mm 19.7 x 7.9 x 17.7 inch
Weight	15 kg 33 lb
Power supply	110 / 230 V 50/60 Hz

[a]Special care needs to be taken with these group 1 fluids, [b]gas phase only

Gas inlet, Vacuum pump, and Vent outlet connections incorporating metallic connections with metal gasket for 1/8 inch tubing.

Indication of the inlet and outlet pressure by two **analog pressure gauges.**

Additional **digital outlet pressure sensor** for more accurate control



Two gas outlets to control the pressure of two distinct systems at the same time. They use the same metallic connection principle as the gas inlet.

Six robust manual valves to manage gas delivery to the tank and to the systems requiring pressure control.

Manually operated pressure reduction and pressure control valve

300mL buffer tank. The pressure control principle of FLEXI HP 200 is based on the volume difference between this tank and the systems . Small pressure variations in the systems are absorbed by the bigger volume of the buffer compared to the systems' volumes

Schematics of FLEXI HP 200

FLEXI HP 1000



HIGH ACCURACY AND ULTRA HIGH PRESSURE CONTROL SYSTEM

- Provided by the combination of an ultra high pressure syringe pump with a large range pressure transducer
- Controls pressure of two systems simultaneously

PLUG&PLAY, EASY AND SAFE

- Convenient and reusable metallic tubing connection
- Easy operation, with touchscreen control for valves operation and control settings
- Equipped with an emergency relief system (rupture disk) to avoid uncontrolled overpressure

MODE OF OPERATION	
Pressure control	By means of a motorized high pressure pump *the outlet pressure can be superior to the inlet pressure*
Control mode	Constant pressure, pressure steps
PERFORMANCE	
Maximum Pressure	1000 bar
Pressure setpoint resolution	+/- 0.1 bar
Outlet pressure stability	The outlet pressure stability is ensured by the syringe pump
Gas types	Helium, nitrogen, argon, hydrogen[a], methane[a], carbon dioxide, dry hydrogen sulfide
Syringe pump volume	up to 56 ml
GENERAL	
Size (W x D x H)	470 x 600 x 290 mm 18.5 x 23.6 x 11.4 inch
Weight	40 kg 90 lb
Power supply	230 V 50 Hz

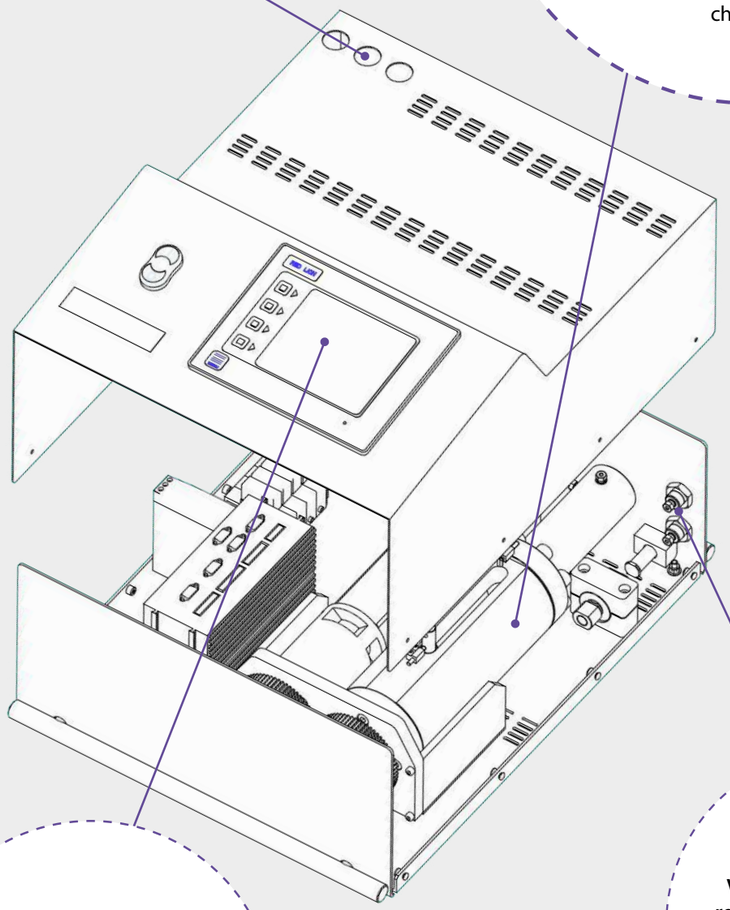
[a]Special care needs to be taken with these group 1 fluids

One gas inlet, two gas outlet connections incorporating metallic connections with metal gasket for 1/8 inch tubing.

The combination of an **ultra high pressure syringe pump** with a **high accuracy pressure transducer** is at the core of FLEXI HP 1000.

The pump pressurizes the inlet gas until the pressure setpoint is reached. This principle also allows reaching an outlet pressure which is greater than the inlet pressure.

The movements of the pump's piston compensate for pressure variations, even those due to ambient temperature changes.



Touchcreen user interface for pressure or flow rate setpoints, pneumatic valves operation, and live data display.

Vacuum and emergency relief system (rupture disk) connections on the back of the instrument.

Schematics of FLEXI HP 1000

FLEXI WET



HIGH VERSATILITY AND ACCURACY WET GAS GENERATOR

for multiple laboratory or industrial applications
- Accurate wet conditions control
- From simple setpoint to sophisticated programming
- Operation with various types of gases

PLUG&PLAY, SIMPLICITY, EASY SETTINGS

- Easily transportable
- Simple connection system to any laboratory instruments or climate chambers
- Simple and convenient user interface

PERFORMANCE (GAS)		
Pre-calibrated for various gases		Air, helium, nitrogen, carbon dioxide, argon
Flow Rate	**FLEXI WET 50**	3 to 50 ml/min
	FLEXI WET 200	10 to 200 ml/min
Heated Transfer line		Ambient to 100°C
PERFORMANCE (HUMIDITY)		
Gas humidity	**Ambient to 50 °C**	0% RH[a]; 5-95% RH
	50 to 70 °C	0% RH[a]; 5-90% RH
Humidity profile generation		Constant RH, steps, ramps
Autonomy		> 1000 hours[b]
Accuracy		+/- 0.8% RH
		+/- 0.1 °C
Stability		+/- 0.3% RH
External RH probe		Optional
GENERAL		
Size (W x D x H)		420 x 530 x 350 mm 16.5 x 20.9 x 13.8 inch
Weight		22 kg 49 lb
Power supply		110 / 230 V 50/60 Hz

[a]operations with dry gas: isolation of the saturator using an automatic valve switch, [b]at 70°C, 90% RH and 20 ml/min

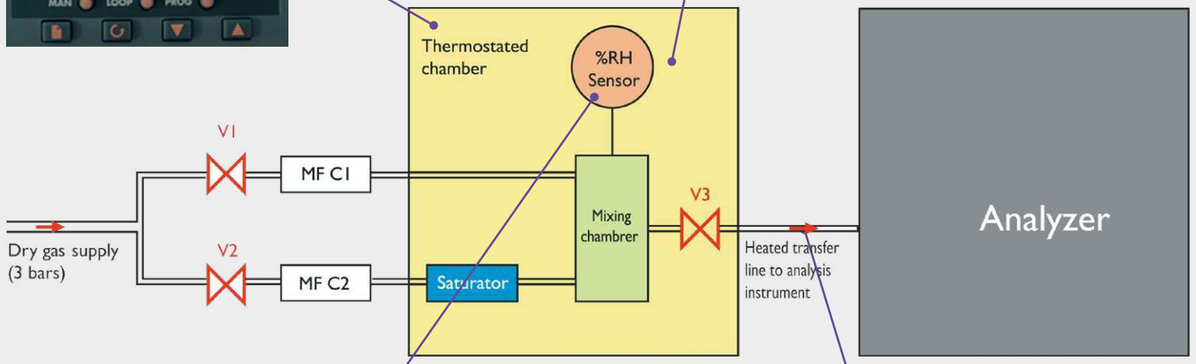
A convenient user interface, allows for:
- Selecting temperature, humidity, and flowrate setpoints
- **Programming** temperature, relative humidity (RH), and flowrate **profiles by sequences**
- The RH sequences can be constant RH, RH steps, RH ramps

FLEXI WET is based on the simple principle of mixing a dry gas line and a wet gas line. Each line is equipped with an electrovalve and a mass flow controller MFC.

Both lines meet in a thermostated mixing chamber, equipped with a humidity probe.

The temperature, relative humidity, and gas flow rates, are integrated in a PID control loop. **It adjusts continuously the mixed gas' humidity to the setpoint.**





The humidity probe is chosen for its great accuracy. As an option, it can be can be calibrated and certified by a metrology institute.

FLEXI WET is provided with a heated line to transfer the mixed gas to the system's inlet. Heating helps provide **a better RH control by avoiding water condensation during the transfer.** The transfer line is equipped with a standard 1/8 inch fitting for a **fast and easy connection.**

Schematics of FLEXI WET

FLEXI BALANCE



HIGH ACCURACY HANG DOWN SYMMETRICAL BEAM BALANCE

With continuous sample mass variation measurement
Signal stability ideal to perform long term experiments
High loading capacity up to 100g with different models

EASY ADAPTATION AND INSTALLATION

Standard connection flanges, with possible customization to special furnaces, reactors, climate chambers or larger instruments.
Easy adaptation to gloveboxes.
Motorized balance lift available.

EASY TO USE

Software controlled from a PC or a laptop, data treatment software available. Possible on-request adaptation to other acquisition systems

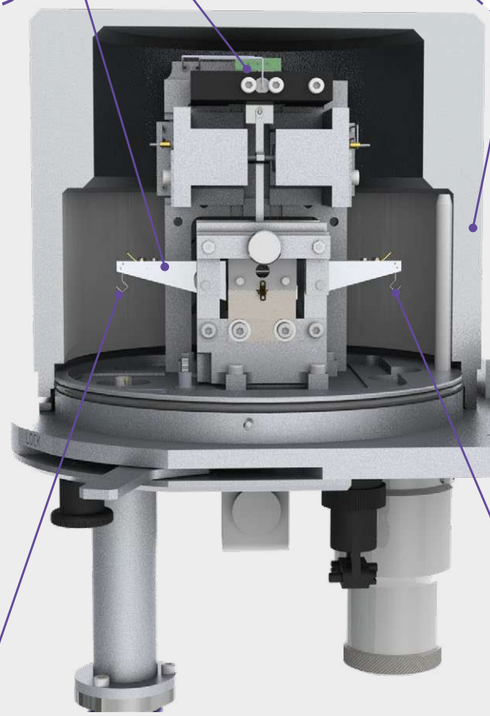
MODEL		HIGH SENSITIVITY	HIGH VERSATILITY	HIGH CAPACITY	FULLY SYMMETRICAL
Technology		Sample + counterweights			Sample + reference sample
Benefits		low drift and high precision	with AUTO TARE feature for increasing experimental flexibility	large mass variations over experimental time	Best drift, stability and accuracy
PERFORMANCE (HUMIDITY)					
Measuring range (mg)	**Small**	+/- 5	+/- 200	+/- 300	+/- 20
	Large	+/- 50	+/- 2 000	+/- 3 000	+/- 200
Maximum loading capacity (g)		35	35	100	35
Mass signal noise (µg)[a]		5			0.5
Mass signal accuracy (%)[a]		+/- 0.2[b]	+/-0.4[b]		0.025[c]
GENERAL					
Power supply		110 / 230 V 50/60 Hz			

[a]at room temperature, equilibrium conditions, [b]based on a 5mg standard reference weight, [c]based on a 40mg standard reference weight

FLEXI BALANCE applications range from **catalysts** characterization to **solid-gas reactions** like oxidation or reduction. It also includes **sorption** of water or other vapors and gases.

FLEXI BALANCE uses a well proven technology based on an horizontal beam and an electro-optical equilibration system. **Any sample mass variation is immediately detected**, measured and compensated to keep the beam always perfectly horizontal.

The balance cover is **tightly closed** for operations under vacuum, but it is still **easily removable.**



Thin **metallic or ceramic** thread is suspended on this balance hook. The sample is hung on this thread, inside the user's system (e.g. furnace, reactor or instrument). This technology offers the **best interaction between the sample and the system's atmosphere environment.**

The second suspension hook is used to hang **counterweights** or a reference sample (it depends on the chosen balance model)

Schematics of FLEXI BALANCE

FLEXI HP MS



REAL-TIME ANALYSIS OF GAS COMPOSITION AT HIGH PRESSURE

It uses a quadrupole mass spectrometer including :

- a proprietary gas dosing manifold for gas sampling from vacuum to 200 bar
- a standard gas flow mode for continuous gas sampling at atmospheric pressure

PLUG&PLAY, EASY SETTINGS

- can be connected to third party instruments, reactors or to climate chambers
- virtually avoids gas condensation before detection using a temperature controlled transfer line
- 6 modes available for enhanced control of scans and data

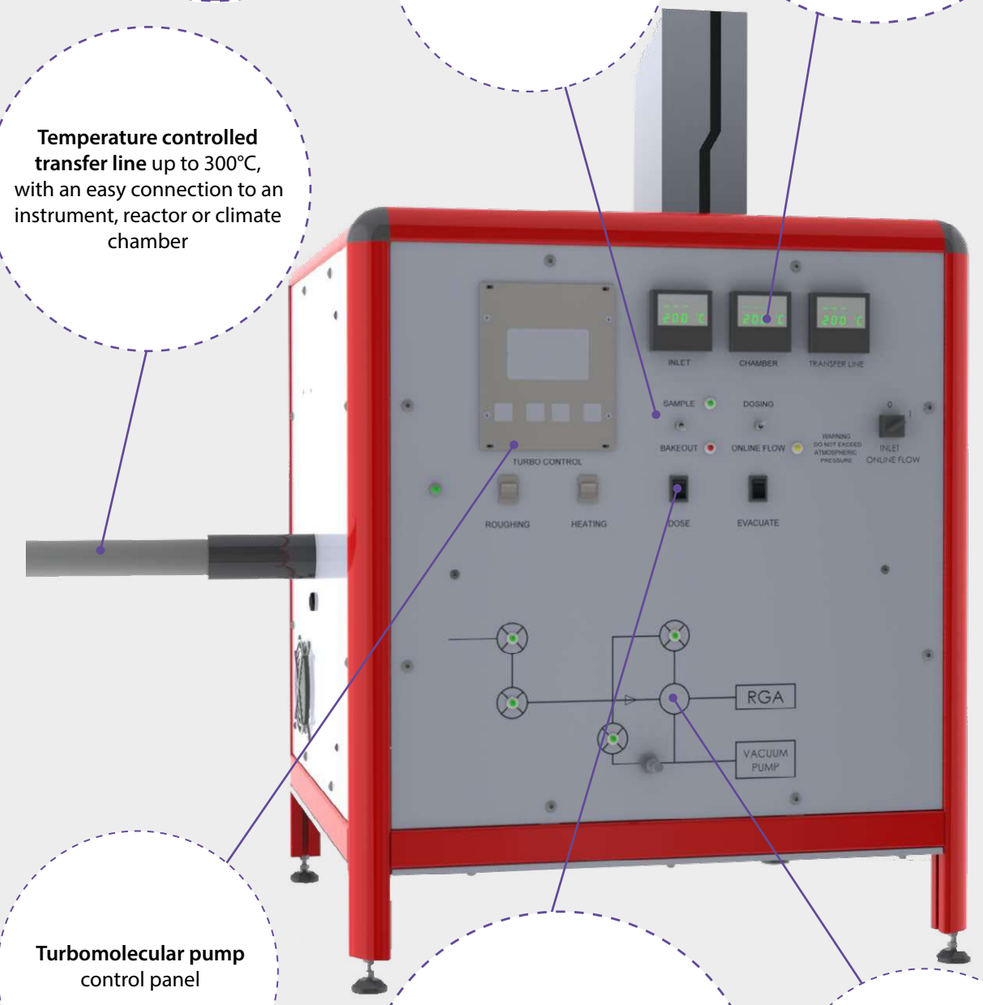
EQUIPMENT	
Residual Gas Analyzer	Quadrupole mass spectrometer
Filament	Unique long life, dual thoriated
Detector	Faraday cup
Electron Multiplier	Optional state-of-the-art, multi-channel, continuous-dy-node electron multiplier (EM) for detection down to 1×10-14 mbar with increased longevity and stability
MODE OF OPERATION	
Dose	Up to 200 bar, using an automated procedure with pneu-matic valves
Flow	At atmospheric pressure, using a manual valve
PERFORMANCE	
Mass range	1 to 100 amu (200 and 300 amu ranges optional)
Resolution	<1 amu
Pressure range	Allows sampling over the entire vacuum to 200 bar operating pressure range
GENERAL	
Size (W x D x H)	470 x 600 x 290 mm 18.5 x 23.6 x 11.4 inch
Weight	40 kg 90 lb
Gas supply	Air or inert gas for operation of pneumatic components – 50 psig
Power supply	110 / 230 V 50/60 Hz

Sophisticated software control of scan and data acquisition allows various scan modes and includes automatic gas identification based on stored spectra from a standard reference library.

Panel for selecting **operation mode:** Dose or Flow

Temperature control panel for **three heating zones** (transfer line, gas manifold, high vacuum zone)

Temperature controlled transfer line up to 300°C, with an easy connection to an instrument, reactor or climate chamber



Turbomolecular pump control panel

Push button for the l**aunch of the gas dosing procedure.** This automated dosing sequence opens and closes **pneumatic valves** for gas sampling and analysis.

Panel for **pneumatic valves status display** and control of the manual valve for the flow mode

Schematics of FLEXI HP MS

FLEXI HYCO



COMPACT HP HYDROGEN DELIVERY SYSTEM

- Compresses hydrogen from a low-pressure line or an optional, integrated electrolyser
- Delivers ultra pure H_2 at a set pressure up to 200 bar (2900 psi)

ROBUST AND PATENTED DESIGN

- Stores and releases hydrogen from a metal hydride bed
- Operates without moving parts: silently, vibrationless, safely, and without maintenance

PLUG & PLAY, EASY AND SAFE

- Easy manual operation, no time-consuming setup is required
- Avoids the use of high-pressure cylinders in your lab, greatly facilitating operations and increasing safety
- Safe by design with CE marking

PERFORMANCE	
Outlet pressure range	From 10 to 200 bar (145 to 2900 psi)
Hydrogen Storage Capacity	Up to 90 Nl or up to 180* Nl
Maximum Outlet Flowrate	Up to 0.8 Nl/min or up to 1.6* Nl/min
Inlet pressure	10 bar
Hydrogen inlet options	Electrolysers, low pressure gas line, high pressure cylinders stored outside
Electrolyser's technology**	Polymer Electrolyte Membrane (PEM) cell
Maximum electrolyser's output flow**	1.2 to 14.2 Nl/min at 12 bar***
Electrolyser's water reservoir volume**	0.3 l to 1.1l***
Electrolyser's gas purity**	6.0 to 7.0***
GENERAL	
Gas connections	1/4 inch swagelock compression fitting
Size (W x D x H**)**	483 x 481 x 133 mm 19 x 19 x 5.2 inch
Power supply	(110V, 10A -) 230V, 5A – 50/60Hz

** With the expansion module option*
*** With the hydrogen generator option*
**** Depends on the selected model*
***** The height is given for a single FLEXI HyCo, without Expansion module, Hydrogen generator or Manual pressure regulator. Contact us to know the exact height of your preferred configuration.*

FLEXI HyCo is based on a proprietary Metal Hydrides Compressor technology. At low temperature, hydrogen atoms are absorbed in a metallic alloy. The equilibrium pressure at room temperature is less than 10 bar. On demand, the metal hydrides bed is heated up to increase the pressure to the set point.

A manual pressure regulator is used when a perfectly constant hydrogen pressure is required



A rackable hydrogen generator can be provided as an option. It uses a long-life Polymer Electrolyte Membrane (PEM) cell. Other inlet options are a low-pressure gas line, an outdoor high-pressure cylinder, or a third-party electrolyser.

Expansion modules are available for multiplying the storage capacity and maximum flow rate

Picture of FLEXI HYCO

MC • Specifications are given as indications only and are not contractual • 07/20



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