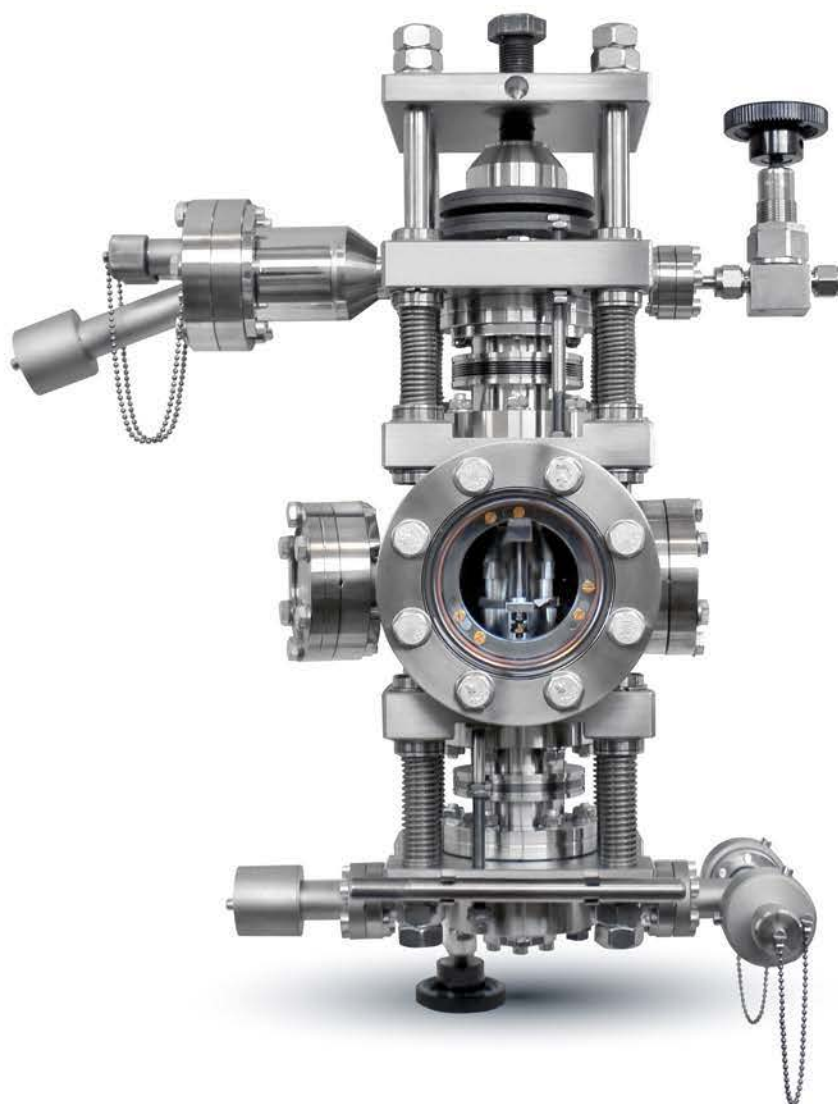


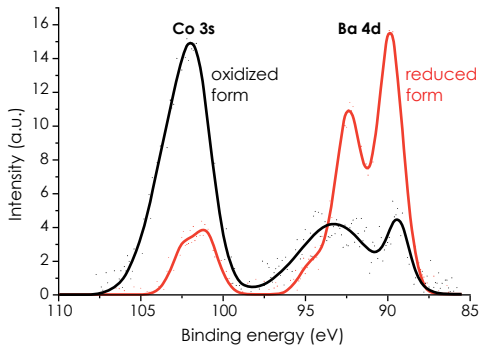
Precision and Vacuum Technology



## FLOW THROUGH HIGH PRESSURE REACTOR

Making HP conditions inside UHV environment

The **Flow Through High Pressure Reactor** is designed to study reactions between gases and solid/powder samples under high pressure (between reactor's cups), in the reactor chamber under UHV conditions. Samples could be subject on static or flowing gas, with the heating up to 750°C and possibility of cooling down to -100°C (option).

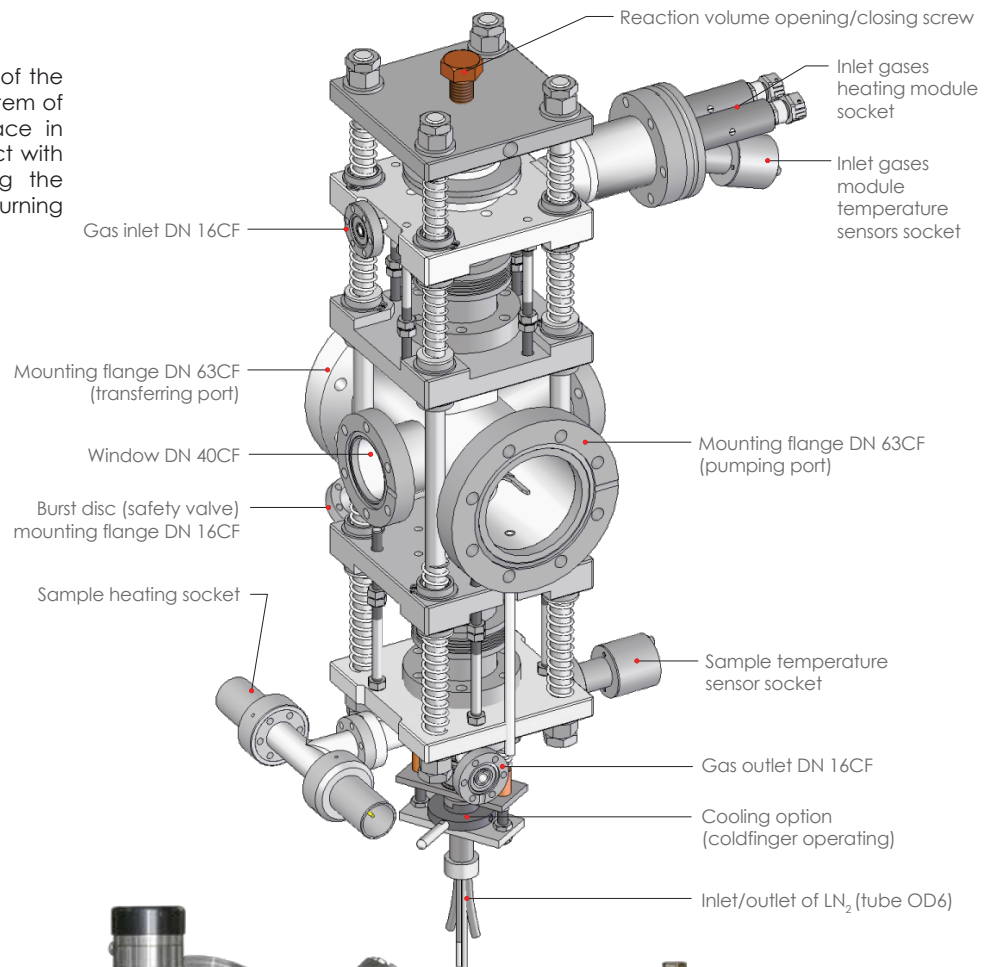


◀ A catalyst sample - carbon sample coated with cobalt oxide  $\text{Co}_3\text{O}_4$  and barium carbonate  $\text{BaCO}_3$ , was examined just after impregnation. Co 3s and Ba 4d XPS spectra were obtained: black line marked as oxidized form of the catalyst. XPS analysis shows a considerable share of cobalt in the surface layer (in the form of oxide). There are only few barium compounds in this layer.

The sample was also a subject to hydrogen reduction. It was performed in PREVAC reactor at a temperature of 500°C for 5 hours. Then the sample was transferred into analysis chamber to collect XPS spectra (shown in red). There is a significant change in the composition of the surface. Barium compounds dominate, while cobalt (now in metallic form) has much smaller share than before the reduction.

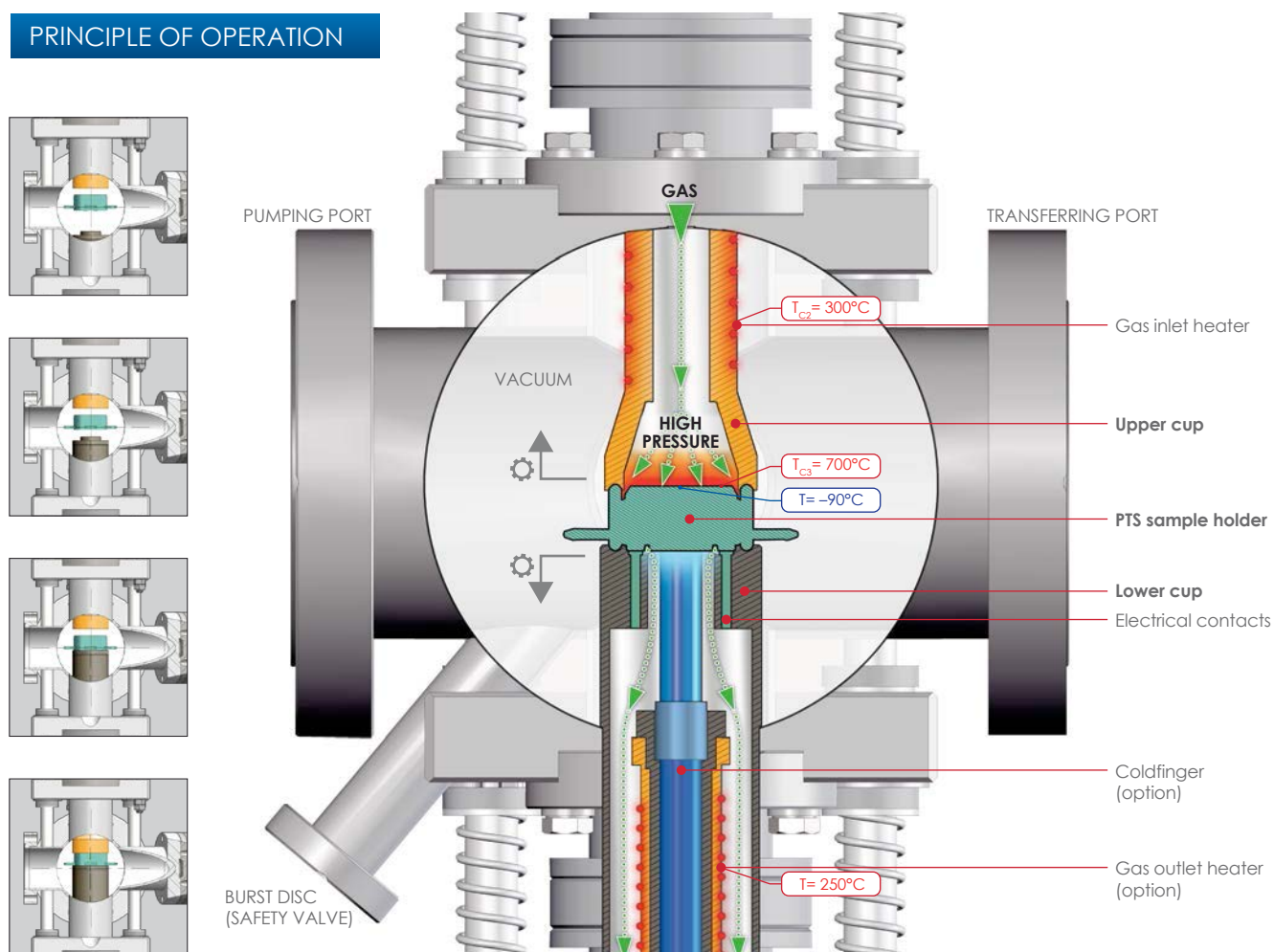
## CONSTRUCTION

Inside the vacuum chamber of the **High Pressure Reactor** is a system of cups which is a closed space in which a sample have contact with gases. Opening and closing the cups is done manually by turning a reaction volume screw.



◀ Configuration with Radial Distribution Chamber

## PRINCIPLE OF OPERATION



## DEDICATED SAMPLE HOLDERS

The sample mounting table can be made of stainless steel, titanium, gold or other materials/alloys, depending upon application. The temperature of sample holders is regulated by HEAT3-PS Power Supply.



**PTS 700/-90 HPC RES-Thcx/C-K RG** has possibility of indirect sample heating up to 700 °C and cooling down to -90 °C. It is equipped with a unique heater design for heating in reactive gases at pressures up to 20 bar.



**PTS 700/-90 HPC RES-Thcx/C-K RG PS** dedicated for high pressure reactive gas studies of powdered catalyst samples. Allows for maximum heating of the samples up to 700 °C and cooling down to -90 °C at pressures up to 20 bar.

Configuration with Linear Transfer



## PRESSURE

Experiments with reactive gases at static or flow mode (temperature of gases up to 300°C) can be performed at pressure from **1 bar** up to **20 bar** (depends on the type of gas dosing system).

## OTHER HP REACTORS ALSO AVAILABLE



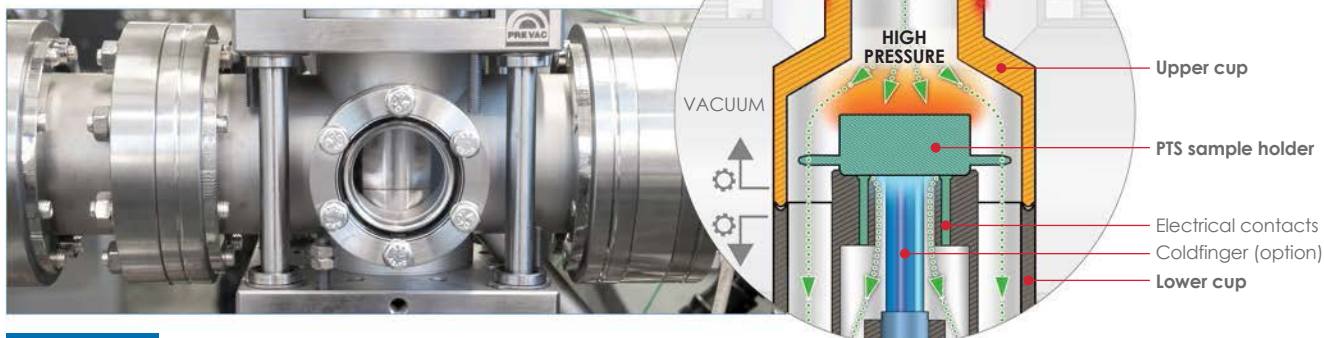
for FLAG style holders



for PUCK style holders

## SPECIAL DESIGN HP REACTOR

Special design allows for closing the whole PTS sample holder inside reactor cups, therefore there is only one sealing surface. This solution requires larger volume of gas.

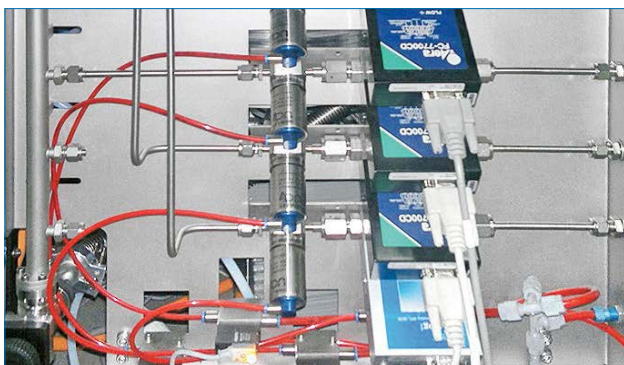


## OPTIONS

- **coldfinger** for sample holder cooling
- **back pressure regulator** – needed in case of experiments from 2 – 20 bar in flow mode. Dedicated gas manifold with proper flowmeters required
- **heated outlet of the gases**
- **temperature control software** (HEAT3-PS dedicated software) – full software control of temperature, ramp rate and output power
- **RAPID SE** – required in case of programmable heating (require temperature control software)
- **reactor dedicated to work with CO and H<sub>2</sub>S** – on request
- **an additional measuring equipment**, for example UMS to conduct spectrography and chromatography of the gas which is flowing out from the reactor

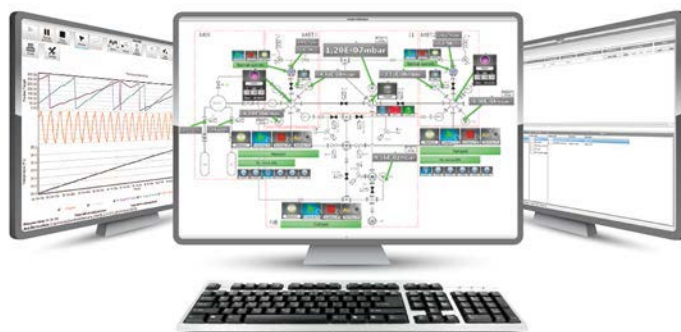
## GAS DOSING SYSTEM

- **Process gas 2÷4 lines**
- **Mass flow controlled for 4 gases**



## RAPID SCIENTIFIC ENVIRONMENT

Rapid SE is rapid lab environment system builder for scientists offering many of useful features developed especially to meet most of experiment expectations. Software is a core for creating intuitive, robust and reliable platform for data acquisition, controlling complete system, process creating and easy controlling and many more.



## HEAT3-PS POWER SUPPLY

Power supply operated by completely intuitive touch screen with resistive heating and high efficiency.

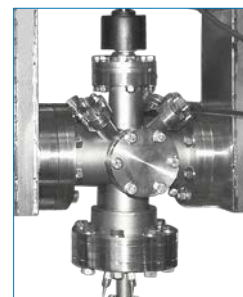
- **Wide range temperature measurement 1.4 - 2470 K**



IN OUR OFFER YOU WILL ALSO FIND:

### Static High Pressure Reactor

designed to facilitate high pressure experiments (up to 1 bar) with various gases.



HP REACTOR



If you need any further information, please do not hesitate to contact our sales department

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