Can you control the flow of H_2 and what is the minimum gas flow rate achievable?

You can control it with increments of 1 mL/min, from 100 to 1000 NmL/min.

What is the volume and catalyst capacity of the reactors?

The smallest cartridge that we supply for the Phoenix is the MicroCart™ with an internal volume of 100 µm. The biggest one is the 250 mm 1" metal-metal sealed column (ca. 81 mL). Other sizes in between are available, e.g. 0.8 mL for a 70 mm CatCart™, 6.4 mL for the MidiCart™, etc.

Depending on the material of choice you will have different filling masses. For example, for the 70 mm CatCart™, the estimated filling mass using 10% Pd/C is 260 mg, whereas it is ca. 3.8g for the MidiCart™.

What is the reactor bed type?

The catalysts are filled as packed bed type, except for the Raney types that can be also as a mixed bed type (combination between a packed and fluidized bed). Nevertheless, since you can also fill the MMS very easily with your own catalyst, it will mainly be according to your needs. Note there can be a big change of activity depending on this filling.

How is the gas-liquid mixing achieved? And how is achieved in the reactor?

The gas-liquid mixing is more efficiently achieved with a gas-liquid mixer. This is different from a tee union 3-ways mixer as in the gas-liquid mixer, the flow goes through a frit filter which helps increasing the interface area between liquid and gas by reducing the size of gas bubbles.

In the reactor (or cartridge), the three phases, the solid catalyst, the starting material in a liquid solution and the hydrogen in the gas phase will all cohabit in the reactor. The hydrogen solubility in water being very low, the reactions will mostly occur at the interface, and the surface area to volume ratio is becoming a predominant factor if success in those flow systems.

Must the catalyst be a pellet or a powder?

Usually, the cartridge is filled with catalyst in powder form. But the use of pellets is not excluded as long as it fits into the reactor and the surface to volume ratio of them are good enough. Make sure that the catalyst's particle size is appropriate for the cartridge, for example too small particle size can lead to high pressure drop or even to clogging.

Is it possible to use Hastelloy instead of Stainless Steel? (e.g. use of corrosive gases)

Hastelloy (or even PTFE) can of course be used instead of SS in the case of corrosive gas.

Is it possible to couple the Phoenix™ with an H-Cube Pro™ as H_2 generator in absence of the H-Genie®?

It is possible indeed. The Phoenix™ and H-Cube Pro™ (but also the H-Cube Midi™) is another available platform that intends to extend the capacity of the H-Cube instruments, in terms of temperature but also scale. This combination is ideal for hydrogenations that have to be performed above 150°C or where 2 cartridges are required. As a reminder, you can achieve 60, 125 and 1000 NmL/min H_2 flowrate with the H-Cube Pro™, H-Cube Midi™ and H-Genie®, respectively.

Is it possible to couple the Phoenix™ with the PhotoCube™?

This combination is also possible. It can be convenient in case of multistep synthesis. Since the tubing material and temperature & pressure capabilities are different for both instruments, you have to make sure your materials and conditions are compatible with your tubing and instrument.

Is it possible to couple the H-Genie® with the Photocube™?

It is also possible. You just have to keep in mind than tubing used for photochemical reaction (PEF or PFA) can only bear relatively low pressure (ca. 12-30 bar depending on the inner diameter and wall size of the tube)

Is there any risk of explosion?

With the H-Genie®, the handling of H_2 has become much safer than with cylinders and any risks of explosion or fire have been drastically reduced thanks to the process itself, storage and in-built safety features, in the respect, of course, of the usual safety considerations that are inherent to any laboratory environment. If any leak or communication error is detected, or not used for 1 hour, the system automatically shuts down, after emptying the remaining H_2. Moreover, the H_2 is only stored in the system internal tubing that has a maximum volume of 150 mL.