

Biotage® Endeavor™ FAQ

Frequently Asked Questions

Q: Is there cooling? Is there danger of a runaway reaction?

No, small volume + large reactor means maximum temperature rise of less than 1 °C. Calculate it yourself. 1 mmol of reactants, reaction generates 100 kJ/mol, total heat is 100 Joules. Steel reactor weighs several hundred grams (around 5 moles), heat capacity is around 40 J/mol*degree, total change in temperature is 0.5 °C. This assumes there is no heat exchange with the outside environment, a worst case scenario. The glass liner is 1.25 mm thin and the surface area is very high, it takes 5 seconds to dissipate 100 Joules. Remember most reactions take place over tens of minutes, or even several hours.

Q: Is there sampling?

No, the idea is to determine which reaction parameters are worthwhile pursuing. Monitoring the gas consumption tells you if the reaction is working or not. After you quickly find the right conditions it can then be run at a larger scale on conventional instrumentation with sampling. If you like you can set up all the reactors to run under identical conditions and quench them at different times. The contents of each reactor can then be analyzed when the final reaction is complete, each gives a 'snapshot' of the reaction, mimicking sampling.

Q: How are the temperature and pressure kept constant?

Each individual reaction vessel has a thermocouple and heater, which together with a feedback algorithm control the temperature to the value you set. Each individual reaction vessel regulates its own pressure transducer and gas valve which, together with a feedback algorithm, regulate the pressure to the value you set.

Q: Safety? Rupture disks, flammable gases, venting, spark sources, tested pressure limits, regulatory requirements, etc.?

The instrument has a pressure relief valve that releases the gas in the system if the pressure exceeds 600 psi. If the pressure relief valve releases, the valve can be reset and reused.



Q: How is data recorded when individual reactions start at different times?

The acquisition of data such as the gas consumption is started by a user command on the keypad. This can be done on an individual basis or for all vessels simultaneously whenever the user wants. Using the software, the gas consumption monitoring is tracked when the "Start Run" command is initiated.

Q: What if something breaks or a reactor vessel leaks? Can I still use the others or do I need to send in the entire bank for repair?

The reactors are physically separate and not all reactors need to be used for an experiment, you only program the reactors you want to run.

Q: Are the glass liners standard items or special order?

They are custom made for Biotage, we keep a supply of them on hand.

Q: How is the pressure regulated, at the tank or at the instrument?

The pressure of any of the supply gases, inert, reactive, or quench, should not exceed 600 psi (40 bar). This is typically done by the use of a pressure regulator at the gas cylinder or source. Supplying this is the responsibility of the customer.

**Q: How do I download data? What format is it?
Can I see it when the instrument is running?**

Using the standard software supplied with the instrument gas consumption data is displayed in real time. After the experiment is done data is stored in a tab delimited text file for ready import into programs such as MS Excel or standard scientific graphing programs. This takes about two clicks of the mouse.

Q: Does the impeller mix properly? Are you diffusion or mass transport limited in reaction kinetics?

The impeller design is the result of careful evaluation. In the case of polymerization reactions, which are extremely sensitive to mass transport issues, there is no evidence for mass transport limited reaction behavior. The current design is suitable for slow hydrogenation reactions. Different impeller designs will allow faster hydrogenation; it is very easy to change the impeller on Endeavor.

Q: I want to control the heating rate, ramp the temperature, ramp the pressure, and have custom control of the venting/gas purging sequence, etc. Is this possible?

The software supplied with the instrument allows both single set point temperatures and pressures as well as the ability to program sequential pressurization or heating, similar to a ramping program. There are pre-programmed routines for standard venting and purging routines.

Q: What is the minimum/maximum reaction volume?

The useful volumetric range for Endeavor reactors is 1ml -7ml using the anchor impeller and methanol. These values depend on the impeller type and viscosity of the solvent used. The range for the blade type impeller is 1ml - 5ml.

Q: How long does it take to cool the system down?

The reactor temperature drop from 200 °C to ambient can take a couple of hours. The reactors can reach 50 °C in less than 1 hour. This can be accelerated by using a large fan to circulate ambient air over the top of the Endeavor. Note: these are estimated and are not specifications to the instrument.

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