HumiPyc Model 1 Gas Pycnometer design advantages

We offer two models of HumiPyc gas pycnometers for density measurements of various materials.
The main difference between the ***Model 1*** and ***Model 2*** is that ***HumiPyc Model 1*** has all the measuring components housed in a thermally controlled chamber from about sub-ambient to 50 C. Internal gas pressure regulator and gauge are also specific to the ***Model 1.***

Table for Model 1

ADVANTAGES of the HumiPyc Model 1 GAS PYCNOMETER / Density Analyzer			
Nr.	HumiPyc Model 1 Novel Design Features	Comment	Competition
1.	Thermally controlled chamber from sub-ambient to 50 C (Peltier module cooling)	Volume (density) measurements can be carried out at the same temperature despite ambient temperature variations, and various temperatures from just sub-ambient to 50 C can be used. Temperature is manually set on the temperature controller located on the front panel.	
2.	Precision pressure regulator and gauge	Non-relieving pressure regulator (Max. input 250 psi) and gage are provided for utilizing any common gas source, no need for a dedicated gas source.	
3.	Use of proportional valves for programmable rate progressive (continuous) pressurization and depressurization to avoid removal of fine powders from the sample chamber	Other pycnometers use only ON/OFF valves and pressure surges can cause elutriation that lead to incorrect results, and immediate contamination of the instrument (e.g. valve seats, transducer). This feature is critical for measuring volume (density) of samples containing fine powders (nanotechnology).	
4.	Standard vacuum port provided with flexible hose and fittings to a KF16 port on a vacuum pump	For highly micro-porous sample, activated carbon, and variety of other samples, outgassing by using vacuum is necessary to avoid erroneous results. Air (oxygen) in the carbon pores as well as other contaminants may lead to serious errors for volume determination of highly activated carbon, proportional to the level of “activation”.	
5.	Two, small and large, reference chambers	The same instrument (single unit) can be used for measurements of very large spectrum of sample sizes and volumes. No need to purchase dedicated modules for samples of specific volumes.	
6	Comprehensive set of pieces or volume reduction	From the largest volume, over 120 cc, down to well under 1 cc, the sample volume can be measured accurately using these volume reduction pieces and one of the two reference chambers. Volume reduction pieces serves to improve accuracy by reducing dead volume of the sample chamber.	
7	No need for dedicated sample holders	Many manufacturers use expensive and dedicated sample holders matching the chamber size to reduce the	

		effect of pressure surges. The HumiPyc design does not require specific sample holders. Our design philosophy is simple: whatever fits, and is fit for use, it can be used.	
8.	Uni-Block design	Both reference chambers and all passages are machined into a single solid aluminum block, corrosion protected. That ensures good temperature uniformity and practically elimination of leaks.	
9.	Reduced volume error design of sample chamber closure	The new design of the sample chamber reduces volume error committed when the sample chamber is opened and closed again as it typical for threaded sample closures. The HumiPyc design of the sample closure allows for and introduction of variety of sensors and utilization of other experimental technique using the same instrument.	
10.	24-bit data acquisition	To the best of our knowledge, this is the only gas pycnometer on the market with 24-bit resolution of the data acquisition. A fraction of one Pascal pressure is very easy to resolve, high stability.	
11.	The most comprehensive Calibration Kit with for calibration and/or verification with tools for convenient spheres insertion and removal	Thirteen sizes of spheres are provided for calibration and testing of volume down to 0.5 microLiter. Many manufacturers provide only few large calibration spheres and quote “accuracy” derived from the repetitions at controlled conditions. They do not provide spheres of very small volumes to verify what the actual error of the volume measurements using small volumes, which practically is far greater than the quoted paper specifications. Only our Calibrated kit includes vacuum suction tools (not magnetic pick-ups) for handling the calibrated larger spheres.	
12	Direct testing of hardware via front panel controls	Manual operation (testing, troubleshooting) can be done easily using front panel controls for direct control of hardware for volume determinations and other experimental techniques)	
13.	Powerful PC software for experiment design (standard, not optional)	This is the only pycnometer where every piece of data is available to the user and can be analyzed using spreadsheets. All parameters for experiment design can be modified by the user at any time. Complex experiments, beyond the classical pycnometry can be programmed and the templates saved. New experiment can be carried out with a few mouse clicks. Equilibration profiles and other quantities can be graphically observed during run and a report can be printed.	
14.	Programmable criteria for equilibration time duration and graphical representation.	Either the time limit or the pressure change within time can be programmed. Graphical representation of the equilibration during pressurization or depressurization is very helpful for a method development for a given type of samples. One of the basic assumptions in volume determinations is that once the sample is pressurized, it does not retain gas during depressurization (not quite true for e.g. foams, highly micro-porous materials.	
15.	Automatic runs at different values of pressurization	Volume (density) of many materials, due to different compressibility, is affected by the level of pressurization	

	pressure.	pressure. Using the proportional valves in HumiPyc, an experiment with increasing and decreasing pressurization pressure can be obtained and reversibility of the compression of different materials can be studied.	
16.	Capabilities to carry out complex experiments using (proprietary) “macro” language design.	Certain functional experimental procedures (steps) with their own parameters are tagged and either simple pycnometric measurements or complex experiments consisting of the steps with a tag number can be designed, templates saved, and reused. Far greater information about the sample for R&D purposes can be obtained than from classical pycnometers.	
17.	Capability of Additional analytical techniques, e.g. Bubble Point test, Pressure Decay test, Gas transfer rates using pressure gradient method, RH testing	The novel design allows to implement additional analytical techniques with addition of ancillary hardware. Also a very unique capability of measuring sample volume using vacuum by multiple extraction can be carried out.	