Pycnomatic ATC
For solids and powders density

The first multi-volume gas pycnometer with integrated automatic temperature control


Building materials


Pharmaceuticals


Soils, rocks, mining


Powder materials


Polymers, foam


Ceramic materials


Irradiated materials

Pycnomatic ATC
For solids and powders real density determination

Pycnomatic ATC Automatic Temperature Control

The Thermo Scientific Pycnomatic is the ultimate development for density measurement of solid materials available. Based on the technique of gas displacement to measure real density of solids and powders, Pycnomatic delivers unrivalled fast and accurate results.

Real density is a fundamental parameter required to complete the characterization of many solid materials and powders. In addition, density analysis by gas displacement technique is a rapid and reliable way to determine the purity of solids, whenever an immediate but precise test is required. This applies to a wide array of technological fields such as: ceramics, mineralogy, geology, pharmaceuticals, metallurgy, pigments, building materials, foams, plastics, polymers, abrasives and catalysts, just to name the most important.

Simple yet effective

Pycnomatic uses mainly helium as a test gas. This features a very small atomic size that can even permeate the extremely narrow pores in a solid sample, permitting the determination of the real volume occupied by the sample. The ratio of the dried sample weight and the volume measured by the Pycnomatic gives the real density of the material. The high thermal conductivity of helium and its ideal gas behavior at around room temperature, make this technique extremely reliable and fast. Whenever helium is not recommended (i.e. for activated carbons) other inert gases like nitrogen can be used.

Built-in accurate temperature control

- The use of an external circulation bath
- Fastest system stabilization
- Reduced analysis time
- Eliminates repeated calibrations
- Permits density investigation at different temperatures
- Unrivalled reproducibility of density results

Built-in multi-volume capability

- Easy choice of the best configuration according to sample volume and nature
- Constant accuracy in a wide range of volumes
- No requirement for instrument modifications
- No requirement for continuous recalibrations

Features and Benefits

Fully integrated and automated temperature control	Calibrations and measurements are independent from room temperature variations. High reproducibility of results. Fast thermal stability of sample. Eliminate continuous recalibration. No need for an external circulation bath. Save bench space
Utmost precision in temperature control and pressure stabilization	Highly accurate and reproducible results
Real multi-volume analytical capacity	Delivers a constant level of accuracy and reproducibility, virtually independently from the sample volume
Easy and fast chamber volume change	Different density/weight materials can be tested in a short time frame with high precision
Choice of different purging procedures (flow, pulses or vacuum)	Flexible parameter setup producing the best accuracy with solid samples. Choose the best drying procedure for a particular type of material
Large backlit display and comprehensive alpha-numeric keyboard	Fast and easy accessibility to all the pages relevant to the analysis, calibration and instrument parameters. Detailed and comprehensive sample identification. Virtually no training is required for instrument use
Mechanics are detachable from the electronic compartment	The unit is ready to be installed in a glove box for testing irradiated and radioactive materials
Three different communication ports to a PC, balance and a printer	Saves time during sample preparation and report generation. Data processing and data storage in electronic format
Progressive gas load, expansion and discharge	Improves speed in pressure stabilization, no need for filters to prevent powders elutriation by pressure drop, reduced maintenance
Gas loaded first into reference chamber (high pressure), then expanded into sample chamber (low pressure)	Permits the analysis of foams or compressible samples avoiding possible material shrinkage

Utmost flexibility assured by real multi-volume capability

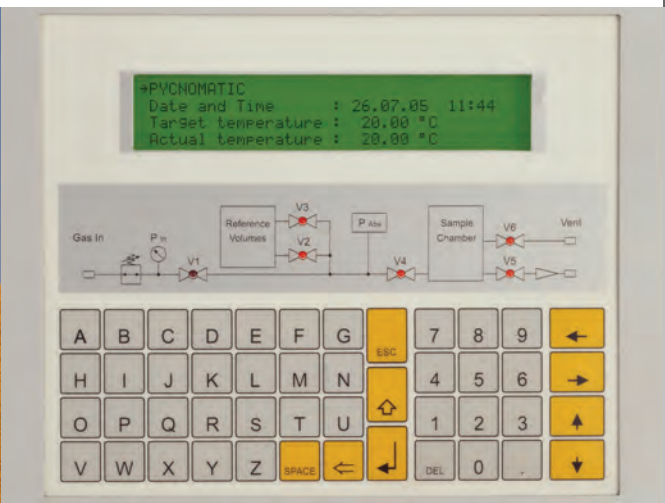
In density measurement, the best accuracy is produced when the measuring chamber volume of a pycnometer matches the available sample volume to be analyzed. When different types of materials have to be tested, a real multi-volume multi-reference instrument offers the utmost flexibility and accuracy, regardless of the quantity of sample available. Pycnomatic features five different sample chambers, ranging from four to one hundred cubic centimeters. The user can easily change the chamber volumes without any service intervention. The instrument will then select the optimal volume for the reference chamber. Pycnomatic can keep in memory up to three calibration sets for both reference and sample chambers.

Safe analysis of powders and foams

Pycnomatic is uniquely designed to eliminate any risk of valve and tubing contamination, which can occur in analysis of fine powders. In the Pycnomatic the gas pressure is always carefully controlled to prevent sudden pressure changes. In the case of fine powders, venting to atmosphere is performed through a dedicated outlet port that ensures the pressure drops slowly down to atmospheric value without any risk of either sample loss or system contamination. Finally, the pressure applied to the sample is kept at the minimum required to obtain accurate results, thus reducing the risk of sample compression (i.e. in the case of foams).

Sample identification, data input/output and reporting

The large backlit display (four lines by forty characters), together with the alpha-numeric keyboard, enables simple and quick set-up of all the analytical parameters. Furthermore, users can type into the sample information page a detailed description of the material under test including comments. For the benefit of highly regulated laboratories all this information is then printed along with the sample results. All the analytical, calibration and communication/reporting parameters can be easily edited to optimize the performance. Pycnomatic can be connected directly to a balance, a printer and a computer, so the report is generated automatically at the end of the experiment and printed or sent to the computer in electronic editable format. Finally, a dedicated software displays all the phases of the measurement and automatically saves data files of up to ten repeated experiments.



The first density analyzer with fully integrated temperature control: fastest results and unmatched accuracy

In gas pycnometry the speed of analysis is mainly limited by the time taken to reach the thermal stability and by the required level of reproducibility in the determination of sample volume. The innovative and powerful temperature control of the Pycnomatic is based on a built-in powerful Peltier device that dramatically reduces the time necessary to achieve the thermal stability of the sample. The user obtains a very high level of precision in a matter of minutes. The ability of the system to reach the thermal equilibrium quickly is of particular benefit when a high sample throughput is required. The Pycnomatic avoids both long dead times and a high number of purging cycles before the test.

Stop calibrating and start measuring!

Environmental temperature changes continuously, thus in non-temperature controlled analyzers precision and reproducibility in density tests are not assured unless the instrument calibration is repeated regularly. Pycnomatic offers a built-in extremely precise, powerful and fast response temperature control system. The reference and sample chambers, the manifold and the pressure transducer are all maintained at a constant temperature, chosen by the operator with a precision of +/- 0.01 °C. The user chooses the Pycnomatic temperature in the range from 18.00 °C to 35.00 °C avoiding any effect on internal volume changes that can occur due to room temperature fluctuations. Want precision? With Pycnomatic you can finally start measuring your samples and eliminate continuous re-calibrations!

Pycnomatic-Density Measurement Report

Sample name	Cement powder
Comment	Dried at 100 ºC in oven for 30 minutes
Operator	
Analysis start	23.01.05 11:26
Analysis end	23.01.05 11:57
Vessel Correction	0.00000 cc
Vessel ID no.	1
Vessel weight	3.123000 g
Total weight before	31.80300 g
Sample weight before	28.68000 g
Total weight after	28.68000 g
Sample weight after	28.68000 g
Weight difference	0.00000 g

Analytical Paramters

Reference volume	21.16887 cc (I)
Cell volume	29.14182 cc
Filler volume	0.00000 cc
Repeated analyses no.	3
Flow cleaning time	60 sec
Number of cleaning cycles	3
Sample cleaning time	10 sec
Atm stabilization time	30 sec
Restriction delta presure	150.000 kPa
Equilibrium delta pressure	0.010 kPa
Equilibrium delta time	10 sec
Standard deviation %	0.003 %
No. of good measurements	3
No. of max measurements	100
Temperature set	20.00 ºC

Results

Average sample volume	9.51797 cc
Volume standard deviation	0.00027 cc
% Standard deviation on volume	0.00288 %
Average sample Density	3.01325 g/cc
Density standard deviation	0.00009 g/cc
% Standard deviation on density	0.00288 %
Average sample density after	3.01325 g/cc

Measurement Raw Data

Patmh kPa	Prh kPa	Pch kPa	Temp ºC	Volume cc	Aver. Vol cc	Aver. Dev. cc
100.440	201.056	152.652	19.99	9.51641	9.51641	0.00000
100.441	200.977	152.611	19.99	9.51696	9.51668	0.00039
100.441	200.974	152.610	19.99	9.51712	9.51683	0.00038
100.438	201.048	152.649	19.99	9.51790	9.51733	0.00051
100.436	200.970	152.606	19.99	9.51769	9.51757	0.00040
100.436	201.044	152.646	19.99	9.51856	9.51805	0.00046
100.436	200.966	152.606	19.99	9.51824	9.51816	0.00044
100.436	201.027	152.636	19.99	9.51735	9.51805	0.00063
100.436	201.028	152.638	19.99	9.51870	9.51810	0.00069
100.434	201.048	152.646	19.99	9.51755	9.51786	0.00073
100.430	201.308	152.778	19.99	9.51672	9.51765	0.00100
100.425	201.024	152.630	19.99	9.51817	9.51748	0.00073
100.423	201.042	152.637	19.99	9.51727	9.51738	0.00073
100.420	201.019	152.626	19.99	9.51914	9.51819	0.00094
100.418	201.019	152.626	19.99	9.51933	9.51858	0.00114
100.418	201.017	152.623	19.99	9.51824	9.51890	0.00058
100.419	201.024	152.628	19.99	9.51890	9.51882	0.00055
100.419	201.025	152.627	19.99	9.51784	9.51833	0.00054
100.419	201.360	152.802	19.99	9.51828	9.51834	0.00054
100.420	201.028	152.629	19.99	9.51778	9.51797	0.00027

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BR11011_E 12/06C

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