Grace INSTRUMENT

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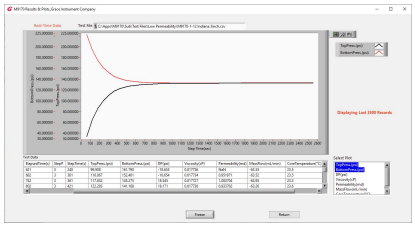
M9170 High Pressure Porosity and Low/High Permeability System

M9170 HIGH PRESSURE POROSITY AND PERMEABILITY SYSTEM

- Porosity range of up to 60%.
- Permeability measurement range from 0.0005 mD to 10 D.
- Measures both high permeability and low high permeability cores using unsteady pulse decay method and steady flow method.
- Calculates Klinkenberg-corrected permeability based on multiple tests.
- Calculates grain density, inertial coefficients, and rock compressibility.
- **FREE** advanced, user-friendly software, compatible with all versions of Windows, included with each unit.
- Software handles all control, measurement, data collection, calculation, and report generation. Automates almost entire testing process, maximizing workflow efficiency.
- Easy-to-clean stainless-steel construction.
- Minimal maintenance required.
- Compatible with nitrogen testing media (helium optional).
- Quick confining pressure build up and release.
- Easy loading and removal of core samples.
- Hassler-type core holder.
- Complementary 1-year warranty. Optional extended warranty also available.
- *Grace Instrument* is an ISO 9001:2015 certified company.

Loading Core Samples is Easy



M9170 Software

PRODUCT DESCRIPTION

Advanced, Cost-Effective Permeability and Porosity System

The *Grace Instrument M9170 High Pressure Porosity and Permeability System* is an advanced instrument that performs porosity and permeability tests on both high permeability **and** low permeability plug-sized core samples under confining pressures of up to 10,000 psi. Standard unit is compatible with nitrogen testing media (helium optional).

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Versatile Device Supports Porosity, Low Permeability, High Permeability, and Klinkenberg-Corrected Permeability

The *M9170* makes porosity measurements using the pressure to volume relationship given by Boyle's law. The porosity of a material is the percent of void space in a known solid volume. Effective porosity is the percent of this space that is interconnected and would be capable of containing oil or natural gas. To measure the effective porosity, a known volume of gas is pressurized in the reference cell. When the valve is opened, gas expands into the core holder and the new pressure is measured. Since pressure is inversely proportional to volume from Boyle's law, the volume of the gas displaced into the pores of the cylinder can be calculated. From this value, the porosity and the grain volume of the core can then be found.

The *M9170* measures both low **and** high core gas permeability by using the **unsteady state pulse decay method and steady state flow method**. When the *M9170* uses the unsteady state pulse decay method, the gas permeability of low permeability cores is measured. A known atmospheric volume of gas is pressurized and trapped in the reference cell and the exit valve is kept shut. When the valve is opened, the gas will flow through the core holder due to the pressure difference. The permeability of the core can then be determined as a function of the gas pressure decay.

When the *M9170* uses the steady state flow method, the gas permeability of high permeability cores is measured. The gas at the entrance valve is initially pressurized. All valves are then opened, allowing the gas to flow through the core. At steady-state flow conditions (dP/dt=0 and dq/dt=0), the gas pressure and flow rate are measured and used to calculate the permeability using the integrated form of Darcy's Law for compressible fluids. Permeability has been demonstrated to be a function of reciprocal pressure.

The *M9170* is also able to calculate the Klinkenberg-corrected permeability using gas permeability measurements at different pressures.

Preconfigured PC Includes Complementary, Advanced Grace Instrument M9170 Software

Advanced *M9170 High Pressure Porosity and Permeability Software* is included **FREE** with each unit.

This intuitive, user-friendly software automates testing and accurately records results from the unit to any standard Windows PC, simplifying the testing workflow. Valves are automatically opened and closed, and almost all other testing procedures are fully automated step-by-step from start to finish. The user only needs to make very minimal regulator adjustments during testing, maximizing workflow efficiency. The *M9170* software handles all control, measurement, data collection, and calculation of grain density, inertial coefficients, and rock compressibility based on the results of the porosity and permeability tests.

Data is saved in .csv file format and can be conveniently exported to Excel or any other spreadsheet software for further manipulation and analysis.

The software also generates charts and reports. In particular, Klikenberg and low permeability data have special chart views for easy comparison.

No software installation or setup is required! A preconfigured computer, including all necessary hardware and software components, will be set up by *Grace Instrument*. The software will be installed on the PC by a *Grace Instrument* technician for your convenience.

Tabletop Device Easy to Clean and Maintain

This device fits easily on a standard tabletop or lab workbench. Cleanup between tests is quick and easy. The chassis of this device is made of stainless-steel and is easy to wipe down. A small compartment on the left side of the unit latches open to allow the user to easily replace reservoir oil.

The Grace Instrument Quality Promise

The *Grace Instrument M9170 High Pressure Porosity and Permeability System* is a powerful testing tool. Engineered with over 20 years of experience and the latest in core analysis technology, this reliable, long-lasting testing device features modern features and design that have been successfully used by laboratories and large corporations worldwide.

Custom specifications, automation, specifications, and other solutions are also available. Contact *Grace Instrument* to learn more. Our team is readily available to answer any questions you may have and guide you to find the ideal custom solution for all your testing needs.

A complementary 1-year warranty is included with each device. Optional extended warranties are also available.

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**Testing media options vary depending on user's selected specifications.*

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SPECIFICATIONS

Condition	New
Maximum Confining Pressure	10,000 psi (690 bar)
Maximum Pore Pressure	500 psi (34 bar)
Porosity Range	Up to 60%
Permeability Range	0.0005 mD to 10 D
Core Diameter	1.5 in. (1 in. Optional)
Core Length	Up to 3 in.
Wetted Material	SS-316 Stainless Steel
Wattage	200 W
Voltage	Varies per unit. Either a 110-120V AC configuration OR 220-240V AC configuration (not both), depending on user's power supply requirements.* *Please check electrical labeling on your unit to verify which voltage configuration applies.
Frequency	50/60 Hz
Dimensions	24" W x 26" D x 20" H
Weight	150 lbs.
What's Included	M9170 Unit Core Holder Mass Flow Meter (0-3 SLPM) High Precision Transducer DP Transducer Preconfigured Computer with Grace Instrument M9170 Software
Warranty	1-Year Warranty (Optional extended warranty available.)

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