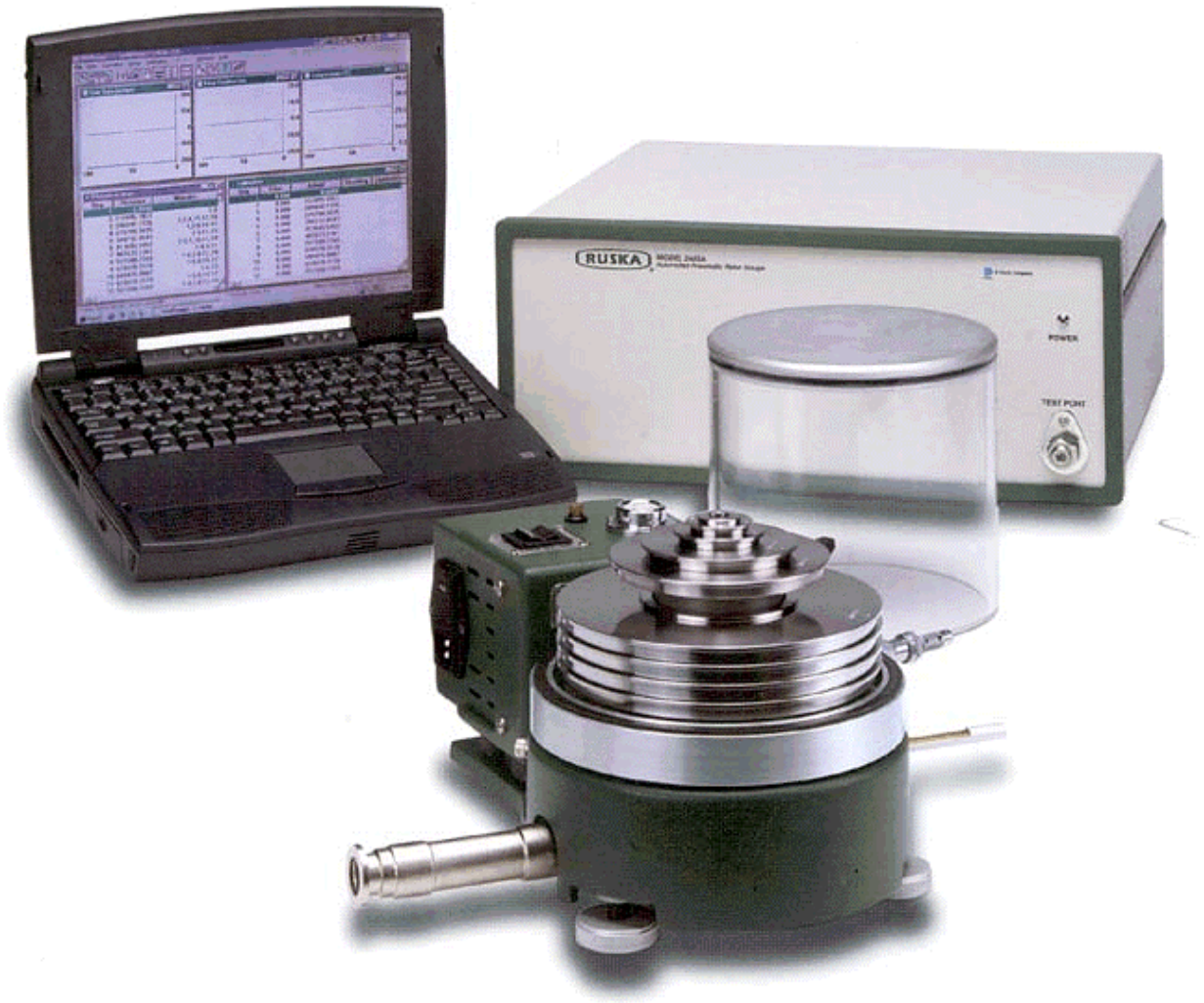
2465

MODEL 2465

Gas piston gauge

- New autofloat controller available
- Pressure range 0-70 bar, 14 mbara to 70 bara
- Accuracy to 0.0015% (15 ppm) of reading
- Precision better than 3 ppm
- Stability better than 3 ppm per year
- Resolution 0.0001% (1 ppm) or 1 mg
- Gauge, absolute, vacuum, and low pressure modes
- Setting the standard since 1944



MODEL 2465

Gas piston gauge

The Model 2465 Gas Piston Gauge has a long history of serving national standard laboratories, commercial industry and government organisations as a gas piston gauge standard for over 40 years. Since its original introduction, enhancements have been made to increase performance and reduce operator workload. Now, Ruska offers the next step in the development of the Model 2465. With a new autofloat controller, operator intervention is reduced to simply applying the mass load, while still providing the highest level of performance available in a gas piston gauge: 0.0015% of reading. Time-proven materials, hand craftsmanship, and a lineage of intercomparisons to national standards laboratories at the highest levels are coupled with new technology to make the Model 2465 Gas Piston Gauge the world's choice for a gas pressure standard.

The Model 2465 is available in a variety of configurations to meet individual user requirements. The three basic components of the Model 2465 are the instrument Base, one or more Piston/Cylinder Assemblies, and a single Mass Set. The Autofloat Controller can be added to minimise operator workload and skill requirements, or select an economical Pressure Control Pack. Last, decide which accessories and options will be required.

Instrument Base
The instrument base is designed with functionality, economy and space conservation in mind. All electronic components are housed away from the instrument base to eliminate errors caused by thermal effects and magnetic fields. The thermally isolated motor drive is connected to the cylinder – eliminating pressure fluctuations and maximising productivity. A durable, acrylic bell jar is provided to allow absolute and vacuum modes of operation. A KF25 fitting is also provided to simplify installation and allow low reference pressures.

Piston/cylinder Assemblies
Piston cylinder assemblies are manufactured from proven materials that have evidenced superior strength, durability, low distortion, low thermal coefficients and virtually undetectable hysteresis over the last several decades, and have an unparalleled record of long-term stability. Tungsten carbide is used for all pistons and cylinders, except where the demand for accurate low pressure is met by using high quality stainless steel (low range piston). The lower density of steel facilitates pressures down to 14 mbar.

Assemblies install quickly into the pressure column without the need for special tools. Piston/cylinder changeout can be completed in less than one minute. Three assemblies are available to generate pressures over the total range of the system.

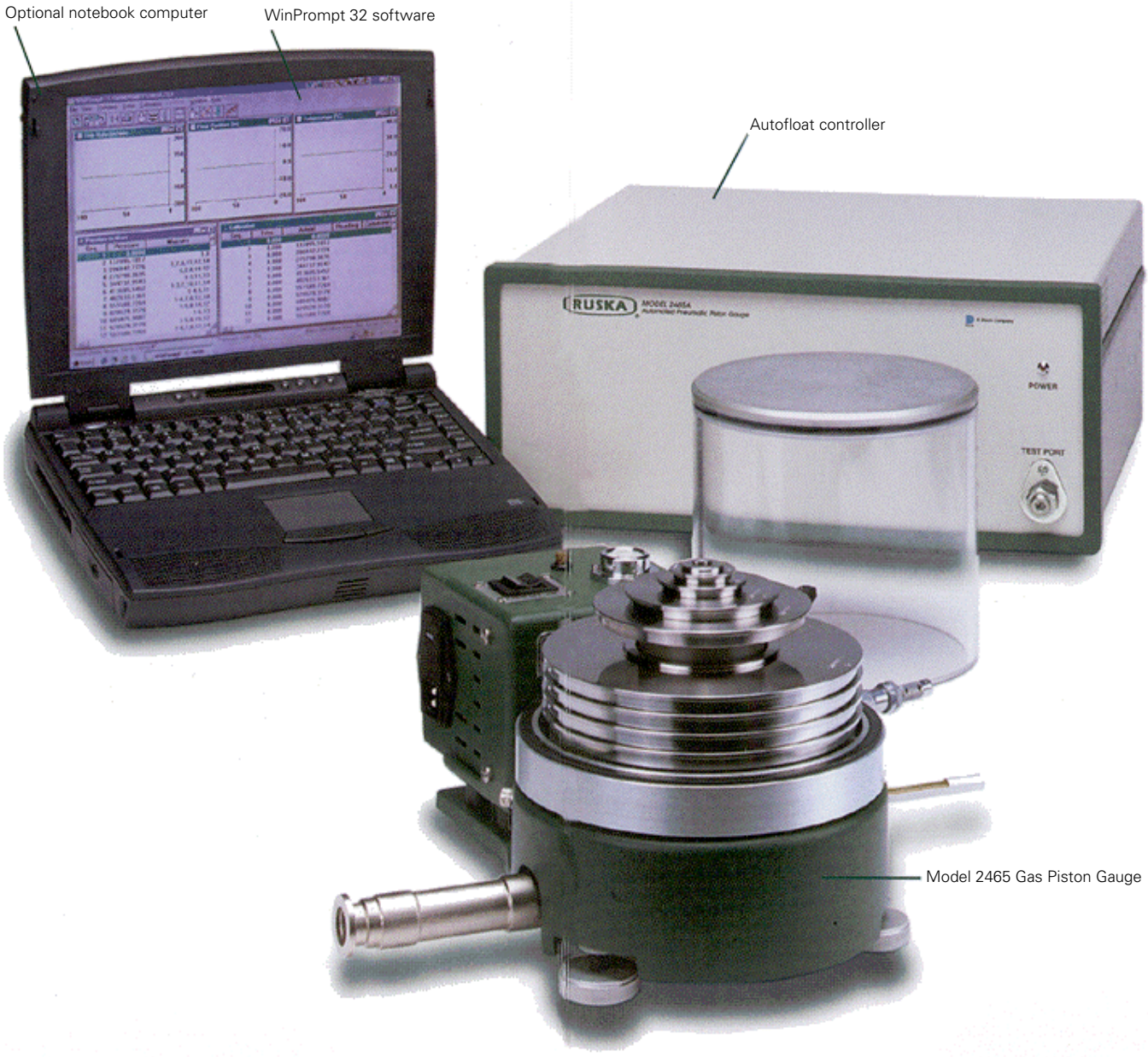
Mass Set
Each mass is machined to a nominal value and is made from non-magnetic materials to provide long-term stability and eliminate sensitivity to magnetic fields. For ease of use, the entire mass set totals just 6 kg, with a maximum platter mass of 1 kg. A laboratory grade trim mass set is included to allow any pressure increment within the range and resolution of the piston/cylinder assembly.

Autofloat Controller
The autofloat controller provides a means of reducing operator workload while achieving the unparalleled performance provided by the Model 2465.The operator simply applies the mass load as instructed by the software, and then selects the autofloat icon on the menu bar. The autofloat controller automatically generates the desired pressure to establish the correct piston float position. A three-color status bar at the bottom of the software screen indicates when the piston is floating within acceptable limits and a reading from the device under test can be entered.

Once the pressure is established, the autofloat controller monitors the speed of piston rotation and automatically engages the Model 2465 motor as required. Since the motor rotates the cylinder, readings can be taken even when the motor is operating, avoiding time-consuming delays.

The autofloat controller also monitors piston temperature, float position, reference vacuum in the bell jar, and sink rate, along with ambient temperature, pressure and humidity to determine air density. This data is transferred to the software which applies all environmental corrections and updates the generated pressure in real time. The autofloat controller also activates the vacuum pumps if required.

The autofloat controller communicates through an RS-232C interface with WinPrompt® 32 software, a powerful calibration management tool. The user can set up procedure files consisting of a table of pressures required to calibrate a particular device. Each time the device requires calibration, the operator opens the procedure file, generates each pressure setpoint, enters the reading from the device, and then saves the results as a calibration file. Calibration reports can be printed from WinPrompt 23. For customisation, WinPrompt 32 supports the Dynamic Data Exchange (DDE) function of Windows so that all data can be easily transferred to word processing and spreadsheet programs for automated report generation and analysis.



Model 2465 with autofloat controller and optional notebook PC shown.

Manual Pressure Control
For manual operation, the Model 2465 can be provided with a Pressure Control Pack for regulating and controlling the system pressure.

Options
- Barometric reference. The Model 2465 equipped with the autofloat controller can be provided with a barometric reference sensor to allow system operation in low pressure mode, and absolute mode without the use of the bell jar and vacuum pump.

- Notebook computer. A standard notebook computer can be supplied with the system. The PC is preloaded with Windows 95 or higher and WinPrompt 32 software.

Upgrade
An existing Model 2465 can be upgraded with the autofloat controller. With the upgrade option, the existing instrument base is modified as the factory. The system makes use of existing piston/cylinder assemblies and mass set for a cost-effective and easy method of gaining system automation. This option allows the user to retain the valuable calibration history on the piston/cylinder assembly(s) and mass set. Refer to the 2465 Upgrade literature for more information.

Operation Modes
The Model 2465 is capable of operating in gauge and absolute modes, and when equipped with the optional barometric reference sensor, also vacuum and low pressure modes.

Gauge mode–pressure is achieved by simply loading the appropriate mass load to the top of the piston.

Absolute mode–can be performed in two ways. A vacuum pump can be connected to the reference pressure port, using standard KF 25 vacuum fittings. The appropriate mass load is applied and the bell jar is placed on the instrument base. The vacuum pump evacuates the bell jar and the residual amount of pressure is measured either automatically with the autofloat controller, with the Model 2455 Deadweight Gauge Monitor, or with a standard vacuum gauge. This method provides the lowest uncertainty.

Absolute mode calibrations can also be performed without using the bell jar if using the Model 2465 and autofloat controller equipped with the barometric reference sensor option. A gauge mode pressure is generated with the Model 2465 and the reading from the barometric sensor is added to the pressure generated by the Model 2465. The result displayed is an absolute pressure. This method reduces the amount of time required to perform an absolute mode calibration with only a slight increase in uncertainty.

Vacuum mode–is achieved by generating a subatmospheric pressure with the Model 2465 and autofloat controller with optional barometric reference sensor. The system then subtracts the generated pressure from the barometric reference sensor and displays, the result: a vacuum(negative gauge) pressure.

Low pressure mode–allows the operator to actually generate pressures down to 0 mbar gauge and is achieved by generating an absolute pressure at or above ambient pressure with the Model 2465 and autofloat controller with optional barometric reference sensor. The system then subtracts barometric pressure from the generated pressure. This mode overcomes traditional tare pressure limitations (tare pressure is the mass of the piston divided by its area), and is especially useful when calibrating low pressure devices with ranges of fractions of a millibar to 70 millibars.

Accessories
Model 2455 Deadweight Gauge Monitor and WinPrompt software–for users who do not require the autofloat capability, but want to add a level of automation to the Model 2465. Working in combination, these accessories assist in promoting consistent technique and improving calibration productivity. The Model 2455 continuously monitors piston temperature, float position, and sink rate, and optionally air density and reference vacuum. WinPrompt calculates mass-to-pressure and pressure-to-mass values, and when used with the Model 2455, automatically reads and displays real-time piston gauge parameters. The Model 2455 is a dual-channel instrument, especially useful for crossfloating two Ruska piston gauges.

Lines and fittings kit–lines and fittings kits are available to ensure that you have all the components needed to install the system and begin performing calibrations.

Vacuum pumps–for applications where absolute, vacuum or low pressure mode calibration will be performed, Ruska can provide high quality vacuum pumps. These pumps are equipped with an auto-vent value and backstream filter to prevent contamination of the Model 2465 and device under test, and a muffler for quiet operation.

MODEL 2465

Specifications

GENERAL

Pressure range
Gauge mode: 14 mbar to 70 bar
Absolute mode: 14 mbara to 70 bara
Vacuum mode (optional): -100 to 0 mbar[a]
Low pressure mode (optional): 0 mbar to 70 bar

Electrical power
115/230 VAC, 50/60 Hz, 15W

Temperature
Operating temperature 15-28 °C, storage temperature –20 to 70 °C

Humidity
Operating humidity 20-75% relative humidity, non-condensing; storage humidity 0-90%

Pressure medium
High purity nitrogen or dry, clean air with less than 0.5 ppm hydrocarbon and less than 5 ppm H_20 content, dew point less than or equal to –50 °C, and less than 50 micron particulate size. Although lower quality gas can be used, the frequency of piston/cylinder cleaning will be increased.

PERFORMANCE

Precision (type A uncertainty)
Better than 3 ppm[b]

Long –term stability
Better than 3 ppm per year[b]

Resolution[c]
1 ppm or 1 mg

PISTON/CYLINDER ASSEMBLIES

Low range
Nominal area: 3.4 cm^2
Pressure range: 14 mbar to 1.7 bar
Minimum autofloat pressure: 70 mbar
Accuracy: 0.0015% RDG or 0.001 mbar (threshold pressure 70 mbar)[c]
Materials: piston is 440C stainless steel, cylinder is cemented tungsten carbide
Thermal coefficient: 1.5E-05/°C

Middle range
Nominal area: 0.84 cm^2
Pressure range: 117 mbar to 7 bar)
Minimum autofloat pressure: 350 mbar
Accuracy: 0.0015% RDG or 0.005 mbar 9threshold pressure 350 mbar)[c]
Materials: piston and cylinder are cemented tungsten carbide
Thermal coefficient: 9.1E-06/°C

High range
Nominal area: 0.084 cm^2
Pressure range: 140 mbar to 70 bar
Minimum autofloat pressure: 2.4 bar
Accuracy: 0.0015% RDG or 0.037 mbar (threshold pressure 2.4 bar)[c]
Materials: piston and cylinder are cemented tungsten carbide
Thermal coefficient: 9.1E-06/°C

MASS SET

Total mass: 6 kg
Maximum mass platter: 1 kg
Includes trim mass set

AUTOFLOAT SYSTEM

Autofloat controller
Positive shut-off controller automatically generates pressure and maintains piston float position at desired pressure, Includes WinPrompt 32 software.

Autofloat range
Low range piston/cylinder: 70 mbar to 1.7 bar
Middle range piston/cylinder: 350 mbar to 7 bar
High range piston/cylinder: 2.4-70 bar

Float position[d]
Inductive sensor
Float position resolution: 0.001 cm
Sink rate resolution: 0.001 cm/minute

Piston temperature[d]
4-wire 100Ω PRT
Accuracy: ±0.1 °C
Resolution: 0.01 °C

Air density[d]
Sensor types
Temperature: thin film platinum 1000Ω RTD
Humidity: capacitive IC humidity sensor
Barometric pressure: piezoresistive, monolithic silicon pressure transducer
Accuracy
Temperature: ±2 °C
Humidity: ±15%
Pressure: ±6.6 mbar

Vacuum reference[d]
Thermopile sensor
Accuracy: 10% of reading or 0.013 mbar (10 mTorr)[c]
Resolution: 0.001 mbar (1 mTorr)

Barometric reference sensor
Accuracy: better than ±0.03 mbar
Resolution: 0.01 mbar

COMPUTER INTERFACE

Autofloat controller with WinPrompt 32
Requirements: Pentium level processor, RS-232C interface, monitor, mouse or other pointing device, keyboard; program requires 2MB available hard disk space; Windows 95 or higher

Model 2465 with Model 2455 and WinPrompt
Requirements; 386, 33 MHz or higher processor, RS-232C or IEEE-488 interface, monitor, moues or other pointing device, keyboard; program requires 2MB available hard disk space; Windows 3.1 or higher.

[A]Vacuum pressure achieved depends on local barometric pressure
[b]Values are reported at the 95% confidence level (2σ)
[c]Whichever is greater
[d]Also applies to Model 2465 equipped with Model 2455 Deadweight Gauge Monitor. Additional information is provided in Model 2455 literature.

Due to Ruska Instrument's process of continuous improvement, the printed specifications are subject to change without notice.

Agent:

Ruska Instrument Corporation
P.O. Box 630009, Houston, TX 77063-0009
+(713) 975-0547 ■ Fax +(713) 975-6338
E-mail: ruska@ruska.com ■ http://www.ruska.com

A Druck Company

Document 9807-0045