

TEMPERATURE CONTROLLERS

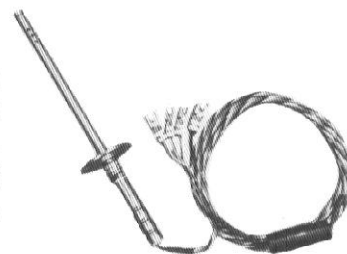
The THERMOTROL is a general purpose laboratory temperature controller designed to function as an on-off, proportional or proportional with reset controller. A resistance thermometer is used as a sensing element. Only one heater (up to 3000 watts maximum) is required, eliminating the multiple heaters necessary with limited on-off controllers. The control action is proportioned by time cycle modulation and can be either a mercury relay or an SCR circuit. The temperature range is determined by the thermal sensing element employed.

Other models include the THERMODYNE which can operate as a proportional or an on-off controller, and the RESISTOTROL which is an on-off controller. Sensitivity of the above controllers is $\pm 0.001^{\circ}\text{C}$ when used in the on-off mode.



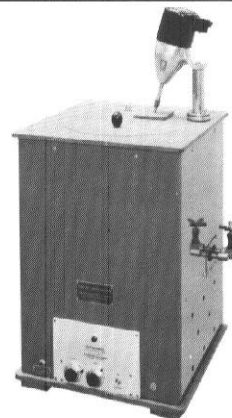
RESISTANCE THERMOMETERS

A complete range of sensors is available to be used in conjunction with the above temperature controllers. Temperatures between -435°F and $+1650^{\circ}\text{F}$ can be accommodated with various models. Mountings include flange, threaded or adhesive types. Sensing elements are either nickel or platinum for use in air or gases, liquids, or on metal blocks.



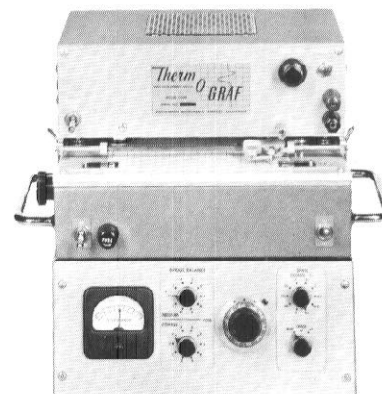
CONSTANT TEMPERATURE BATHS

These baths are designed principally for thermometer testing and calibration. Temperature control may be provided integrally or for remote mounting from the bath. Various models permit operation over the range of -150°F to $+1300^{\circ}\text{F}$. For operation below ambient temperature, an automatic refrigeration unit or cooling coil for use with a coolant (such as liquid nitrogen) is provided with the bath. Although principally employed for calibration purposes, these baths may also be used wherever a constant temperature environment is required, such as in testing solid state devices, etc.



THERMOGRAF

The THERMOGRAF was designed to measure and record increments of temperature—not absolute temperature. The various full scale ranges are 0.1°C , 0.2°C , 0.5°C , 1.0°C , 2.0°C , 5.0°C , 10.0°C , 20.0°C and 50.0°C . When the 0.1°C range is used, each line on the chart represents 0.001°C . The THERMOGRAF is used with a resistance thermometer bulb as the primary element. It can also be used for incremental resistance measurements.



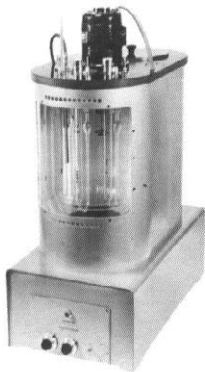


FALLING BALL VISCOMETER

(Shell Development Design)

Viscosity of liquids is sometimes determined by measuring the time required for a sphere to fall a known distance. This viscometer operates on this principle, however, all operations are completely automatic.

Upon actuation of a lever, a $\frac{1}{32}$ " diameter sphere is automatically dropped into a tube containing the sample. As it falls down through the sample it will pass between two coils located at the top and bottom of the sample tube. Elapsed time for the sphere to pass between the coils is measured electronically and instantaneously displayed. A total of seven tubes can be housed in the viscometer thus providing for measurement of many different samples in the shortest possible time.

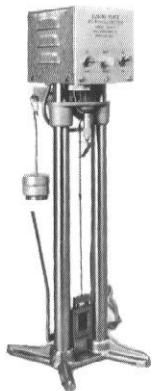


KINEMATIC VISCOSITY BATHS

The Hallikainen KINEMATIC VISCOSITY BATHS are intended for use in performing precision viscosity and density tests. They have been designed to meet the requirements of the petroleum industry for constant temperature baths covering a wide temperature range and having high accuracy and simple, sturdy construction.

There are three baths which together cover the temperature range from -70°F to 400°F . The Low Temperature Bath operates from -70°F to ambient, using dry ice as coolant. The Medium Temperature Bath has a temperature range from ambient to 220°F and the High Temperature Bath a range from 200°F to 400°F .

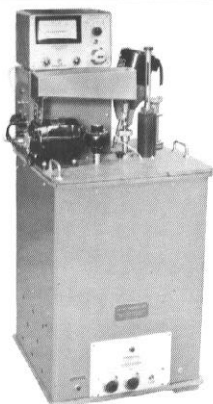
Each bath includes a THERMOTROL to control the temperature of the bath liquid.



SLIDING PLATE MICROVISCOMETER

The SLIDING PLATE MICROVISCOMETER combines the simplicity of the classical concept of viscosity—shearing a sample between two parallel flat plates—with the sensitivity and accuracy of an electronic circuit for measuring the movement. It is a precise and versatile instrument for determining viscosity in absolute units and is suitable for penetration-grade asphalts, liquid asphalts and other viscous materials. This viscometer has a range of one thousand to one hundred billion poise. Since the shear rate may be accurately determined, it is equally applicable to materials having Newtonian or non-Newtonian properties.

The MICROVISCOMETER is designed for operation in constant temperature water bath normally used for testing asphaltic materials.



LABORATORY VISCOMETER

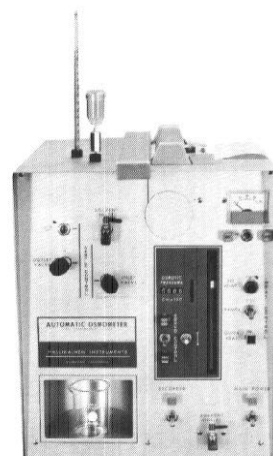
Absolute viscosity is measured by this instrument using the method of measuring differential pressure across a capillary tube. By maintaining a constant flow rate through the tube and with sample at constant temperature, the viscosity of the sample is a linear function of the differential pressure. Viscosities can be measured to 2500 centipoise at temperatures from ambient to 250°F . Constant temperature is provided by a bath, an integral part of the instrument.

AUTOMATIC OSMOMETER

(Shell Development Company Design)

This instrument was developed for the determination of number-average molecular weights of natural and synthetic polymers. A built-in recorder is featured together with a temperature controller that can be set to control the sample cell temperature between 35° and 135°C. The range of osmotic pressure measurement is up to 9.0 cm of solvent head. Number-average molecular weights between 5,000 to 500,000 can be calculated from this range of pressure. This instrument can be used with aqueous solutions as well as those involving organic solvents.

Ease in flushing the solvent is an important feature of this instrument. It includes a cell design that permits a quick interchange of cells for changing solvents and temperatures without the need of an additional instrument for conditioning of membranes, etc.

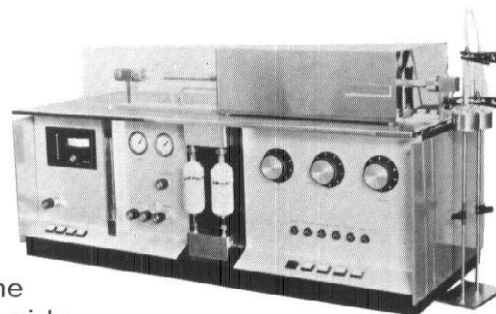


AUTOMATIC MACROCOMBUSTION APPARATUS

(Shell Development Company Design)

This analyzer permits rapid, precise and automatic carbon-hydrogen determinations by the classic Leibig procedure with a minimum of operator training and attention. Combustion of the sample is fully automatic, enabling many more analyses to be completed per day than with the manually controlled method. Output determinations run between 10 to 20 per day.

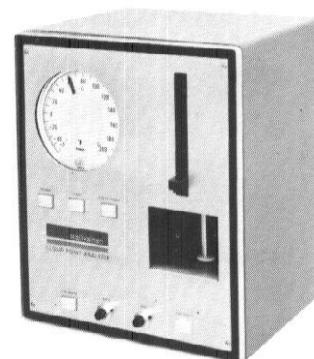
Combustion of the sample causes the gaseous by-products to be swept into absorbers which are weighed before and after each test. This resultant weight gain in the absorbers indicates the amounts of water and carbon dioxide, thus enabling simple calculations to be made for the carbon-hydrogen content of the sample. Any material that can be vaporized at temperatures between 100° and 1000°C can be accommodated in the analyzer.



LABORATORY CLOUD POINT ANALYZER

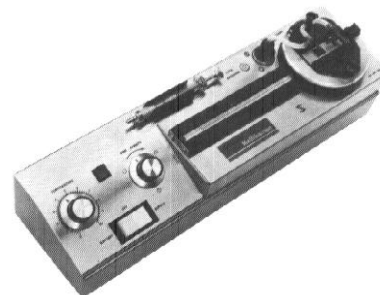
(Shell Refining Ltd. Design)

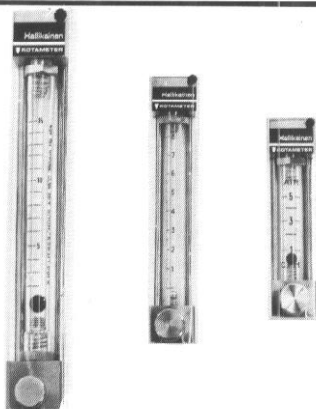
This CLOUD POINT ANALYZER is an automatic instrument for use in the laboratory to detect and indicate the wax precipitation temperature or cloud point of gas oils. The instrument is based on the differential temperature method of cloud point determination. A small sample cell containing the oil under test is placed in the cooling chamber of an electrothermal cooling unit. The detector assembly, consisting of two thermistors and a thermocouple, is lowered into the oil to a predetermined position. An automatic cycle of events is then initiated by operation of a start switch. Range of the analyzer is down to -40°C. A test cycle can be completed within 5 to 15 minutes depending on the cloud point.



SETAFLASH TESTER

Primary application of the SETAFLASH is rapid flashpoint determination of volatile products. A "go or no go" confirmation can be made within one minute. Any area where accuracy, speed and simplicity of operation are essential, the SETAFLASH will find an application. Correlation is directly with ASTM methods, however, the determination is much faster. Operation can be made from 100-250 volts or an external 12 volt battery. Two models provide a measurement range from 50° to 536°F.





ROTAMETERS

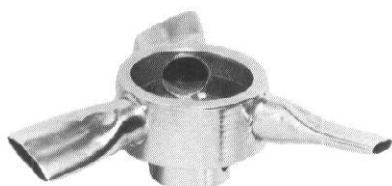
Hallikainen ROTAMETERS are variable area flowmeters for liquid or gas service. Rotameter frames are available in stainless steel or brass in 2½", 4" and 6" sizes. These rotameters are designed to give excellent all-around visibility and easy access to the tube. A plastic shield protects the borosilicate glass tube which can be easily removed from the frame. A single frame will accept a range of tubes with varying flow capacities.



MULTI-BLOCK TUBE HEATERS

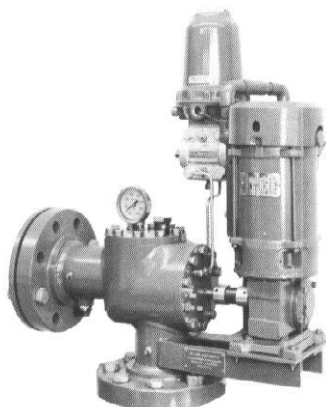
Continuous heating of test tubes and flasks in a dry environment is available with this system. Economical, portable and compact, the tube heaters provide close control of temperature in extractions, digestions, oxidations or other procedures requiring long periods of continuous heating. Interchangeable heat transfer blocks provide great versatility for use with different size tubes, or for operation as liquid baths or hot plates when flasks or other large items are to be controlled and heated.

Range of temperature is from ambient to 300°C, control is to within ±1°C or ±1% above 100°C. Voltage requirement is 115 volts and 50/60 hz.



JET-STIR IMPELLER

In a liquid bath, excellent stirring is essential in maintaining temperature gradients at a minimum and in reducing the amount of time it takes for a heat change to be recorded. The JET-STIR Impeller has solved the problem of minimizing these temperature gradients by combining centrifugal pump action with a pitched blade propeller, resulting in increased stirring efficiency. All the available horsepower in a stirring motor is now convertible to energetic random motion of liquid being stirred. JET-STIR Impellers are manufactured of stainless steel as standard.



CONTINUOUS ANALYZERS

Process analyzers to continuously measure such properties as viscosity, liquid density, moisture, vapor pressure, freezing point and distillation point are also available. An additional brochure covers these analyzers.