

VWR Collection Equipment
Application Guide for Biotech,
Industrial, Pharma and
Production Technology



Temperature Control Solutions Overview

PRODUCT HIGHLIGHTS

VWR® Benchtop Chillers

Environmentally friendly, economical alternatives to tap-water cooling. Maximize precious bench space without compromising cooling and pumping power. These Chillers offer space-saving design, high performance at low temperatures, simple installation, operation, and maintenance, and user-settable high and low temperature and low flow rate alarms.

VWR® Refrigerated Recirculating Chillers

Ranging from 1/4 to 1HP, these chillers are equipped with large, dual displays which present temperature and pressure or flow rate simultaneously and provide cooling at ambient temperatures as high as 35°C. User-adjustable temperature, pressure, and flow rate alarms and optional external temperature tracking and communications capabilities enhance user experience. Included with all 3/4HP and 1HP chillers is the patent-pending WhisperCool® technology, which automatically adjusts the cooling fan speed to match the demand put on the system. This feature makes performance exceptionally quiet and environmentally friendly.

Circulating Baths

Precise and reliable, with sleek lines and large, intuitive digital displays, these VWR® Circulating Baths are exceptionally hard-working and easy to operate and maintain. With refrigerated models with temperature ranges of -40° to 200°C and heat only models with ranges from ambient +10° to 200°C, and temperature stabilities as precise as $\pm 0.01^{\circ}\text{C}$, these circulating baths provide the specifications and reliability necessary for almost any application.

VWR® General Purpose Water Baths

Versatile general purpose water baths feature large digital displays, programmable timers, programmable high limits, programmable calibration temperature offsets, three programmable preset temperatures and audible alarms. Available in reservoir sizes ranging from 2 to 28 liters, these unstirred water baths have a temperature range of ambient +5° to 99°C and a stability of $\pm 0.1^{\circ}\text{C}$.

Immersion Probe Coolers • Viscosity Baths • Coliform Bath



Recirculating Chillers



Benchtop Chillers



Circulating Baths



General Purpose Water Baths

Acid Cooling



Combining acids produces heat which needs to be removed, both to protect the system and maintain the process. The function of the acid cooling system is to remove the heat from the acid flow, ensuring that the process is maintained and process equipment is protected while recovering the heat as useful energy. Chillers provide the cooling capacity required for such tasks.



Recommendations: VWR® Refrigerated Recirculating (1/4 to 1HP) Chillers

- Size dependent
- Choice of pump type (magnetic drive centrifugal, positive displacement, turbine)
- Choice of compressor size (1/4HP to 1HP)

Bundling Options

- external pressure reducer (PD or T pumps) (89200-796)
- external bypass (for MD pump chillers) (89200-798)
- RS232 retrofit kit (89200-800)
- tubing/insulation/hose clamps
- fluids

Asphalt Ductility Testing



Asphalt ductility testing ensures proper characteristics of asphalt mixture, particularly the strength of the mixture under different conditions or stress levels.

Temperature control equipment is utilized in various ways within this process, including sample transportation, sample preparation, and the actual testing. If the sample is being removed from an on-site location, it will need to be cooled and stored to ensure no damage is done to the sample. Further, temperature regulation is required as the sample is prepared. Lastly, the test involves placing the sample within a water bath.



Recommendations: VWR® Refrigerated Circulating Bath

Bundling Options

- fluids
- tubing/insulation/hose clamps
- connectivity
 - RS232 cable, 9' (89201-010)
 - Ethernet cable, 9' (89201-012)
 - USB-A to mini-B cable, 9' (89201-016)

Atomic Absorption (AA) Furnaces



Atomic Absorption Spectroscopy is a technique for determining the concentration of a particular metal element within a sample. Typically, the technique uses a flame or furnace to atomize the sample. The sample is placed inside a tube held in place by clamps and then heated. In order to give reproducible results, the tube heating must be closely controlled. In order to prevent damage to the clamps, they need to be cooled. Any change in clamp temperature will be reflected in the tube temperature. Clamp cooling must be precise and reproducible so it won't distort the test results. A chiller provides the temperature stability required.



Recommendations: VWR® Refrigerated Recirculating (1/4 to 1HP) Chillers

- Size dependent
- Choice of pump type and compressor size

Recommend: Turbine Pump

- 1/4HP: 97044-090
- 1/3HP: 97044-094
- 1/2HP: 97044-098
- 3/4HP: 97044-102
- 1HP: 97044-106

Bundling Options

- external pressure reducer (PD or T pumps) (89200-796)
- external bypass (for MD pump chillers) (89200-798)
- RS232 retrofit kit (89200-800)
- tubing/insulation/hose clamps
- fluids

Bakeries



Recommendations: VWR® Refrigerated Recirculating (1/4 to 1HP) Chillers

- Size dependent
- Choice of pump type (magnetic drive centrifugal, positive displacement, turbine)
- Choice of compressor size (1/4HP to 1HP)

Specific temperatures are sometimes required while mixing raw ingredients before baking. For instance removing heat generated while mixing bread dough allows for the dough to be mixed longer, improving the end product overall. Our chillers can be used to cool the containers to maintain temperature during the mixing process.

Bundling Options

- external pressure reducer (PD or T pumps) (89200-796)
- external bypass (for MD pump chillers) (89200-798)
- RS232 retrofit kit (89200-800)
- tubing/insulation/hose clamps
- fluids

Bioreactor



Recommendations: VWR® Benchtop Chillers or Refrigerated Recirculating (1/4 to 1HP) Chillers

- Size dependent

A bioreactor is a device for growing organisms such as bacteria or yeast that are used in the biotechnological production of substances such as pharmaceuticals, antibodies, vaccines, or even for the bioconversion of organic waste. Bioreactors can range from single reactor systems to systems containing as many as a dozen reactors. Often bioprocesses are major sources of heat. Therefore, cooling is needed to maintain the reactor temperature. Sometimes, tap water can be used, but that is often impractical.

Therefore, chillers can be used to cool the reactors.

Bundling Options

- base with locking casters (benchtop) (89200-794)
- external pressure reducer (PD or T pumps) (89200-796)
- external bypass (for MD pump chillers) (89200-798)
- RS232 retrofit kit (89200-800)
- tubing/insulation/hose clamps
- fluids

Cell Culture



Recommendations: VWR® Refrigerated Circulating Baths

Recommend: Advanced Programmable Controller

- 7L: 89202-974 (-20°C); 89202-892 (-40°C)
- 15L: 89202-990 (-30°C); 89202-998 (-40°C)
- 20L: 89203-006
- 28L: 89203-014
- 45L: 89203-022

Cell cultures are used to develop vaccines, medicine, and other components of biotechnology research and to study viruses, bacteria, and other non-mammalian cells.

As changes in temperature will effect cell growth, our equipment can be used to maintain one temperature or to ramp from temperature to temperature to show the phenotypes resulting from the variations, depending on the specific procedure/research.

Bundling Options

- fluids
- tubing/insulation/hose clamps
- connectivity
 - RS232 cable, 9' (89201-010)
 - Ethernet cable, 9' (89201-012)
 - USB-A to mini-B cable, 9' (89201-016)

Cell Freezing



Cell freezing also known as Cryopreservation, is a preservation technique where cell samples are frozen to sub-ambient temperatures to prevent biological activity, like reactions causing cell death. This allows the samples to stay viable until they are thawed for use.

Recommendations: VWR® Refrigerated Circulating Baths

Recommend: Advanced Programmable Controller

7L: 89202-974 (-20°C); 89202-892 (-40°C)
15L: 89202-990 (-30°C); 89202-998 (-40°C)
20L: 89203-006
28L: 89203-014
45L: 89203-022

Bundling Options

- fluids
- tubing/insulation/hose clamps
- connectivity
 - RS232 cable, 9' (89201-010)
 - Ethernet cable, 9' (89201-012)
 - USB-A to mini-B cable, 9' (89201-016)

Chemical Processing



“Chemical processing” is a term used to describe any way in which chemicals or chemical compounds are altered. Chemical processing can take place naturally or with outside intervention. Chemical processes include fermentation, pyrochemistry, and even photosynthesis. Because these processes create heat, chillers are used to provide the cooling needed to ensure that the process and follow-up testing are done accurately.

Recommendations: VWR® Refrigerated Recirculating (1/4 to 1HP) Chillers

- Size dependent
- Choice of pump type (magnetic drive centrifugal, positive displacement, turbine)
- Choice of compressor size (1/4HP to 1HP)

Bundling Options

- external pressure reducer (PD or T pumps) (89200-796)
- external bypass (for MD pump chillers) (89200-798)
- RS232 retrofit kit (89200-800)
- tubing/insulation/hose clamps
- fluids

Column Chromatography



Column chromatography is generally used as a purification technique. It isolates desired compounds from a mixture. In the stationary phase, a solid absorbent is placed in a vertical glass column. In the mobile phase, a liquid is added to the top and flows down through the column by either gravity or external pressure.

Control and maintenance of column temperature throughout a series of analyses are important, yet frequently overlooked, parameters that can affect retention time reproducibility. Chillers provide the cooling and temperature control needed.

Recommendations: VWR® Refrigerated Recirculating (1/4 to 1HP) Chillers

- Size dependent
- Choice of pump type (magnetic drive centrifugal, positive displacement, turbine)
- Choice of compressor size (1/4HP to 1HP)

Bundling Options

- external pressure reducer (PD or T pumps) (89200-796)
- external bypass (for MD pump chillers) (89200-798)
- RS232 retrofit kit (89200-800)
- tubing/insulation/hose clamps
- fluids

Condenser Cooling



A condenser is a device that transfers heat out of a refrigeration system to a medium (either air, water, or a combination of air and water) that absorbs the heat and transfers it to a disposal point. There are three types of condensers: air-cooled condensers, water-cooled condensers, and evaporative condensers. The evaporative condenser uses a combination of air and water as its condensing medium. Temperature depends on the vapor being condensed.

Recommendations: VWR® Refrigerated Recirculating (1/4 to 1HP) Chillers

- Size dependent
- Choice of pump type and compressor size

Recommend: Turbine Pump

1/4HP: 97044-090
1/3HP: 97044-094
1/2HP: 97044-098
3/4HP: 97044-102
1HP: 97044-106

Bundling Options

- external pressure reducer (PD or T pumps) (89200-796)
- external bypass (for MD pump chillers) (89200-798)
- RS232 retrofit kit (89200-800)
- tubing/insulation/hose clamps
- fluids

CT (Computed Tomography) Scanning



CT Scans produce images of specific areas of the body using X-Ray technology. These scans (usually cross-sectional slices) can be used in medical diagnostic procedures.

CT Scan equipment adds large heat loads to the total at a medical site, so adequate cooling is needed to prevent the equipment from overheating and malfunctioning. Chillers, generally co-located with the unit, cool the high powered electronics inside the machines.

Recommendations: VWR® Refrigerated Recirculating (1/4 to 1HP) Chillers

- Size dependent
- Choice of compressor size

Recommend: Turbine Pump

1/4HP: 97044-090
1/3HP: 97044-094
1/2HP: 97044-098
3/4HP: 97044-102
1HP: 97044-106

Bundling Options

- external pressure reducer (PD or T pumps) (89200-796)
- external bypass (MD pump) (89200-798)
- RS232 retrofit kit (89200-800)
- tubing/insulation/hose clamps
- fluids

Culture Media Warming



A culture media is an environment (perhaps a gel in a Petri dish) designed to enhance growth of different cultures (cells or microorganisms). Culture media temperature plays a big part in ensuring proper development of the culture. Constant temperature must be maintained at all times while warming or dissolving the medium during preparation for sample testing. Therefore a heated circulating bath can be used.

Recommendations: VWR® General Purpose Water Baths or VWR® Heated Circulating Baths

Bundling Options

- fluids
- tubing/insulation/hose clamps
- connectivity
 - RS232 cable, 9' (89201-010)
 - Ethernet cable, 9' (89201-012)
 - USB-A to mini-B cable, 9' (89201-016)

Diffusion Pump



A diffusion pump is basically a stainless steel chamber containing vertically stacked cone-shaped jet assemblies. At the base of the chamber is a pool of a specialized type of oil having a low vapor pressure. The oil is heated to boiling by an electric heater beneath the floor of the chamber. The vaporized oil moves upward and is expelled through the jets in the various assemblies to pump out vapor molecules to create a high vacuum.

A Chiller circulates water through coils on the outside of the chamber to cool the chamber, and condense the oil, thereby preventing thermal runaway and permitting operation over long periods of time.



Recommendations: VWR® Refrigerated Recirculating (1/4 to 1HP) Chillers

- Size dependent
- Choice of pump type and compressor size

Recommend: Turbine Pump

- 1/4HP: 97044-090
- 1/3HP: 97044-094
- 1/2HP: 97044-098
- 3/4HP: 97044-102
- 1HP: 97044-106

Bundling Options

- external pressure reducer (PD or T pumps) (89200-796)
- external bypass (MD pump) (89200-798)
- RS232 retrofit kit (89200-800)
- tubing/insulation/hose clamps
- fluids

Distillation Apparatus



Distillation is a technique for separating components of a mixture on the basis of differing boiling points. The mixture is heated, vaporizing some of the components. The vapor is collected and condensed to isolate the components with the lowest boiling points.

A chiller can be used to condense the vapors back into a purified liquid.



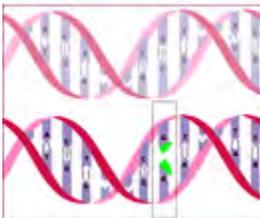
Recommendations: VWR® Refrigerated Recirculating (1/4 to 1HP) Chillers

- Size dependent
- Choice of pump type (magnetic drive centrifugal, positive displacement, turbine)
- Choice of compressor size (1/4HP to 1HP)

Bundling Options

- external pressure reducer (PD or T pumps) (89200-796)
- external bypass (for MD pump chillers) (89200-798)
- RS232 retrofit kit (89200-800)
- tubing/insulation/hose clamps
- fluids

DNA Melting Curves



For DNA, the melting point is the temperature at which 50% of DNA is denatured. Tertiary and secondary structures present in the native form are no longer present, revealing dissociation characteristics such as length, G-C content, and complementarity. To do this, DNA melting curve analysis can identify single-copy gene fragments amplified from genomic DNA.

A heated circulating bath can introduce the heat needed to begin the warming/melting process.



Recommendations: VWR® Heated Circulating Bath

Recommend: 7L Heated with Advanced Digital Controller. **89202-926**

Note: Other reservoir sizes and controller types available.

Bundling Options

- fluids
- tubing/insulation/hose clamps
- connectivity
 - RS232 cable, 9' (89201-010)
 - Ethernet cable, 9' (89201-012)
 - USB-A to mini-B cable, 9' (89201-016)

Dry Ice Replacement



Dry ice is -77°C . In many cases, the end-user may not really need such a low temperature. It is used because it is relatively inexpensive, easy to purchase or even make, and completely non-toxic. Despite the benefits of dry ice, a chiller can be advantageous in the long run as it replaces the need to keep dry ice (or its components) on hand or continually purchase it.



Recommendations:
VWR® Refrigerated Recirculating (1/4 to 1HP) Chillers

Bundling Options
For Chillers

- external pressure reducer (PD or T pumps) (89200-796)
- external bypass (for MD pump chillers) (89200-798)
- RS232 retrofit kit (89200-800)
- tubing/insulation/hose clamps
- fluids

Electron Microscope



An electron microscope illuminates a sample and produces a magnified image utilizing an electron beam. The resolution of electron microscope magnifications is much better than with a traditional microscope, which allows better visibility of the specimen being examined. An electron microscope can magnify objects up to 1 million times. A vacuum is maintained in the lamp housing where the electrons are speeded up until their wavelength is extremely short, only hundredth-thousand that of white light.

Chillers are often used to cool the vacuum pump. It is important that the vacuum pump is cool so that it doesn't shut down, resulting in the shut down of the electron microscope, and thus resulting in a potential loss of revenue.



Recommendations:
VWR® Refrigerated Recirculating (1/4 to 1HP) Chillers

- Choice of pump type and compressor size

Recommend: Turbine Pump
1HP: 97044-106

Bundling Options

- external pressure reducer (PD or T pumps) (89200-796)
- external bypass (for MD pump chillers) (89200-798)
- RS232 retrofit kit (89200-800)
- tubing/insulation/hose clamps
- fluids

Electrophoresis



Electrophoresis is the rate of movement of each component in a colloid suspension (gel) while under the influence of an electrical field. Substances, especially proteins, are separated and molecular size is analyzed. It is very important that the gel chamber is maintained at the proper operating temperature to ensure that heat energy from the electrical current passing through the gel will not damage the gel. Therefore, refrigerated circulators can be used to cool the buffer within the chamber.



Recommendations:
VWR® Refrigerated Circulating Baths

Recommend: 7L models

Bundling Options

- fluids
- tubing/insulation/hose clamps
- connectivity
 - RS232 cable, 9' (89201-010)
 - Ethernet cable, 9' (89201-012)
 - USB-A to mini-B cable, 9' (89201-016)

Enzyme Assays



An assay is a chemical analysis achieved through an investigative or analytic procedure. In enzyme assays, enzyme activity is studied. Like many molecules, enzymes have an optimum temperature (sometimes related to the type of organisms) in which the enzymes are most active. For example, plants grow well near room temperature so their enzymes are most active at a temperature around 30° to 40°C.

A circulator is used to maintain the optimum temperature of a given enzyme sample.

Recommendations: VWR® Refrigerated Circulating Baths

- Bundling Options
- fluids
 - tubing/insulation/hose clamps
 - connectivity
 - RS232 cable, 9' (89201-010)
 - Ethernet cable, 9' (89201-012)
 - USB-A to mini-B cable, 9' (89201-016)

Exothermic Reaction Cooling



Recommendations: VWR® Refrigerated Circulating Baths or VWR® Refrigerated Recirculating (1/4 to 1HP) Chillers

- Size dependent
- Circulating baths come in refrigerated/heated, heat only, and open tank models
- Chillers offer choice of pump and compressor size

Exothermic reactions describe processes where energy, usually heat or light, is released. Examples of exothermic reactions include the combustion reactions of fuels and oxidation of metals. Another type of reaction, thermite, can be used for cutting or welding objects as it introduces extremely high temperatures to small spots.

Because heat is generated, refrigerated circulating baths or chillers can be used to cool the process.

- Bundling Options
- For Chillers
- external pressure reducer (PD or T pumps) (89200-796)
 - external bypass (for MD pump chillers) (89200-798)
 - RS232 retrofit kit (89200-800)
 - tubing/insulation/hose clamps
 - fluids
- For Circulators
- tubing/insulation/hose clamps
 - fluids

Extractor/Concentrator



Recommendations: VWR® Refrigerated Recirculating (1/4 to 1HP) Chillers

- Size dependent
- Choice of pump type (magnetic drive centrifugal, positive displacement, turbine)
- Choice of compressor size (1/4HP to 1HP)

An extractor/concentrator is an apparatus that performs both extraction and concentration. With extraction, a sample is heated to evaporate the solvent. The solvent vapor is then condensed to be used, recycled, or disposed.

A Chiller can be used to condense the vapor.

- Bundling Options
- external pressure reducer (PD or T pumps) (89200-796)
 - external bypass (for MD pump chillers) (89200-798)
 - RS232 retrofit kit (89200-800)
 - tubing/insulation/hose clamps
 - fluids

Fecal Coliform Testing



Fecal coliform, found in the lower intestines of humans and other warm-blooded animals, is one type of coliform bacteria. The presence of fecal coliform in a water supply is a good indication that sewage has polluted the water. Testing to determine the potability of water can be done for fecal coliform specifically or for total coliform bacteria, which includes all coliform strains and may indicate fecal contamination.

Recommendations:

Coliform Bath (89202-922)

Specifically designed for the following Coliform tests:

- APHA, AWWA, WEF and EPA fecal coliform determinations at 44.5°C as specified in "Standard Test Methods for the Examination of Water and Wastewater" (19th edition). The membrane filter method or MPM method can be used.
- APHA, AWWA, WEF 7-hour Fecal Coliform Test at 41.5°C

Bundling Options

- polyclean ALGAECIDE (71002-500; 71002-502)

Fermentation



Fermentation is the process of removing energy by oxidizing an organic compound usually through the use of another organic compound. For example, fermentation is required to produce antibiotics. During fermentation, antibiotic-producing organisms are grown and their antibiotic material is then isolated to be used later in production of the drug.

During the fermentation process, temperature control is a very important part in arriving at the desired outcome. Therefore, a chiller can be utilized to provide the necessary control.

Recommendations:

VWR® Refrigerated Recirculating (1/4 to 1HP) Chillers

- Size dependent
- Choice of pump type and compressor size

Recommend: Turbine Pump

- 1/4HP: 97044-090
- 1/3HP: 97044-094
- 1/2HP: 97044-098
- 3/4HP: 97044-102
- 1HP: 97044-106

Bundling Options

- external pressure reducer (PD or T pumps) (89200-796)
- external bypass (for MD pump chillers) (89200-798)
- RS232 retrofit kit (89200-800)
- tubing/insulation/hose clamps
- fluids

Food Processing



The method of transforming raw ingredients into consumable food relies heavily on temperature control technology. Specific temperatures are critical for handling food. All are sensitive to certain temperature and humidity levels.

Recommendations:

VWR® Refrigerated Recirculating (1/4 to 1HP) Chillers

- Size dependent
- Choice of pump type (magnetic drive centrifugal, positive displacement, turbine)
- Choice of compressor size (1/4HP to 1HP)

Bundling Options

- external pressure reducer (PD or T pumps) (89200-796)
- external bypass (for MD pump chillers) (89200-798)
- RS232 retrofit kit (89200-800)
- tubing/insulation/hose clamps
- fluids

Freeze Point Determination



Freeze point determination is a method used to determine at what temperature a specific solution will freeze within a chilling chamber.

A refrigerated circulator is used to reduce the temperature of the heated solution while the solution is observed for initial crystalline formation and subsequent freezing. These systems require good temperature control with temperature traceability and low heat loads.

Recommendations: VWR® Refrigerated Circulating Baths

Bundling Options

- fluids
- tubing/insulation/hose clamps
- connectivity
 - RS232 cable, 9' (89201-010)
 - Ethernet cable, 9' (89201-012)
 - USB-A to mini-B cable, 9' (89201-016)

General Lab Cooling



General lab cooling covers a variety of disciplines where samples must be maintained at a sub-ambient temperature. A refrigerated circulator will provide the necessary temperature level required to cool the sample.

Recommendations: VWR® Refrigerated Circulating Baths

Advanced Digital:

7L (-20°C): 89202-970
7L (-40°C): 89202-978
7L (low-profile): 89202-962
15L (-30°C): 89202-986
15L (-40°C): 89202-994
20L: 89203-002
28L: 89203-010

Advanced Programmable:

7L (-20°C): 89202-974
7L (-40°C): 89202-982
15L (-30°C): 89202-990
15L (-40°C): 89202-998
20L: 89203-014
28L: 89203-022

Bundling Options

- fluids
- tubing/insulation/hose clamps
- connectivity
 - RS232 cable, 9' (89201-010)
 - Ethernet cable, 9' (89201-012)
 - USB-A to mini-B cable, 9' (89201-016)

General Lab Heating



General lab heating covers a variety of applications where samples must be heated, thawed or maintained at a temperature above ambient. In most applications, a General Purpose Water Bath will provide the temperature stability and range required. When more precise stabilities or higher temperatures are required, a Heated Circulating Bath can be used.

Recommendations: VWR® General Purpose Water Baths or VWR® Heated Circulating Baths

Bundling Options

- fluids
- tubing/insulation/hose clamps
- connectivity
 - RS232 cable, 9' (89201-010)
 - Ethernet cable, 9' (89201-012)
 - USB-A to mini-B cable, 9' (89201-016)

Hydrocooling



Hydrocooling is the process of chilling food, such as fruits and vegetables, in order to stop the process of ripening without freezing, which destroys the composition of the food. The shelf life of foods is also extended by hydrocooling.



Recommendations: VWR® Refrigerated Recirculating (1/4 to 1HP) Chillers

- Size dependent
- Choice of pump type (magnetic drive centrifugal, positive displacement, turbine)
- Choice of compressor size (1/4HP to 1HP)

Bundling Options

- external pressure reducer (PD or T pumps) (89200-796)
- external bypass (for MD pump chillers) (89200-798)
- RS232 retrofit kit (89200-800)
- tubing/insulation/hose clamps
- fluids

Incubation



An incubator provides the ideal environment (temperature, humidity, CO₂, etc.) for growing or maintaining a cell culture, or other living organisms. For most cell cultures, 37°C is optimal temperature and a heating recirculator or circulating bath provides this. The temperature is regulated through an incubation water jacket. In this process, the circulator or chiller regulates fluid temperature and circulates it through the water jacket, determining the temperature inside the incubator.

As incubation can also be done at lower temperatures in order to preserve the cell culture with allowing further growth, refrigeration may be helpful. Accurate temperature control and temperature traceability may also be required.

Recommendations: VWR® Refrigerated Circulating Baths or VWR® Benchtop Chillers

Bundling Options (for Circulating Baths)

- fluids, tubing/insulation/hose clamps
- connectivity
- RS232 cable, 9' (89201-010)
- Ethernet cable, 9' (89201-012)
- USB-A to mini-B cable, 9' (89201-016)

Bundling Options (for Chillers)

- base with locking casters (89200-794)
- tubing/insulation/hose clamps
- fluids

Inductively Coupled Plasma (ICP)



Inductively Coupled Plasma (ICP) is a type of plasma source where electromagnetic induction produces electric currents which supply energy. ICP is utilized in many different applications for elemental analysis. utilized in many different applications for elemental analysis. One technique involves using ICP for the detection of trace metals in environmental samples.

Chillers, generally co-located with the unit on the process floor, are often used to provide the cooling needed to keep components from overheating.



Recommendations: VWR® Refrigerated Recirculating (1/4 to 1HP) Chillers

- Size dependent
- Choice of pump type and compressor size

Recommend: Turbine Pump

- 1/4HP: 97044-090
- 1/3HP: 97044-094
- 1/2HP: 97044-098
- 3/4HP: 97044-102
- 1HP: 97044-106

Bundling Options

- external bypass (MD pump) (89200-798)
- tubing/insulation/hose clamps
- fluids

Laser Cooling



Light Amplification by Stimulated Emission of Radiation (LASER)

A laser is a device that emits highly amplified and coherent radiation of one or more discrete frequencies used for precision cutting, etching, and printing (steps involved in the fabrication of semiconductor components like wafers).

Chillers, often co-located with the unit on the process floor, are used to reduce and control the internal temperature of the solid state components. Failure to remove heat from the laser can lead to the laser not meeting performance standards, or even worse, premature failure of the laser.

Recommendations:
VWR® Benchtop or Refrigerated Recirculating (1/4HP to 1HP) Chillers, depending on laser size.

- Size dependent
- Choice of pump type and compressor size

Bundling Options

- base with locking casters (Benchtop) (89200-794)
- external pressure reducer (PD or T pumps) (89200-796)
- external bypass (MD pump) (89200-798)
- RS232 retrofit kit (89200-800)
- tubing/insulation/hose clamps
- fluids

Liquid Nitrogen Replacement



The temperature of liquid nitrogen is -196°C (77K) and is a cryogenic fluid that causes rapid freezing on contact with living tissue. Liquid nitrogen can be used for many applications, primarily as an open-cycle refrigerant. In many cases, the end-user may not really need such a low temperature. It is used because of its availability. This is the case for cooling samples in analytical NMR. Alternatively, the convenience of a cooler or chiller can be an advantage over maintaining a liquid nitrogen supply on hand.

Recommendations:
VWR® Refrigerated Recirculating (1/4 to 1HP) Chillers

- Size dependent
- Choice of pump type and compressor size

Recommend: Turbine Pump

- 1/4HP: 97044-090
- 1/3HP: 97044-094
- 1/2HP: 97044-098
- 3/4HP: 97044-102
- 1HP: 97044-106

Bundling Options

- external pressure reducer (PD or T pumps) (89200-796)
- external bypass (for MD pump chillers) (89200-798)
- RS232 retrofit kit (89200-800)
- tubing/insulation/hose clamps
- fluids

Liquid Temperature Control



Liquid temperature control is used in a wide array of applications utilized in laboratory and industrial settings. In general laboratory settings, control is required for tempering samples, warming culture media, etc.

Recommendations:
VWR® Circulating Baths

Recommend: Advanced Digital Controller

- 7L Refrigerated (-20°C): 89202-970
- 7L Refrigerated (-40°C): 89202-978
- 7L Heated: 89202-926

Bundling Options

- fluids
- tubing/insulation/hose clamps
- connectivity
 - RS232 cable, 9' (89201-010)
 - Ethernet cable, 9' (89201-012)
 - USB-A to mini-B cable, 9' (89201-016)

Lyophilization



Lyophilization, or freeze-drying, has a wide range of applications and is a dehydration process, often used as a preservation technique for perishable materials. It can be used to increase the shelf life of items like vaccines. There are four stages: Pretreatment, freezing, primary drying, and secondary drying. In freezing, the material is placed within a vacuum chamber to which a vacuum pump and refrigeration unit are connected. In this step, the refrigeration unit (a chiller) would provide the cooling. Once frozen, the drying steps can begin. The vacuum pump clears the chamber and the product is heated. During primary drying, sublimation occurs turning ice directly into water vapor. The vapor is then collected and condensed back into ice.

Recommendations: VWR® Refrigerated Recirculating (1/4 to 1HP) Chillers

- Size dependent
- Choice of pump type and compressor size

Recommend: Turbine Pump

1/4HP: 97044-090
1/3HP: 97044-094
1/2HP: 97044-098
3/4HP: 97044-102
1HP: 97044-106

Bundling Options

- external pressure reducer (PD or T pumps) (89200-796)
- external bypass (for MD pump chillers) (89200-798)
- RS232 retrofit kit (89200-800)
- tubing/insulation/hose clamps
- fluids

PET (Positron Emission Tomography) Scanners



Positron Emission Tomography (PET) Scanners are used to create 3D images for medical and research purposes, looking for places in the human body where biochemical changes are occurring.

Chillers, co-located with the PET Scanner, cool the high powered electronics inside the machines.

Recommendations: VWR® Refrigerated Recirculating (1/4 to 1HP) Chillers

- Size dependent
- Choice of compressor size

Recommend: Turbine Pump

1/4HP: 97044-090
1/3HP: 97044-094
1/2HP: 97044-098
3/4HP: 97044-102
1HP: 97044-106

Bundling Options

- ambient temperature sensor (89200-780)
- external pressure reducer (PD or T pumps) (89200-796)
- external bypass (MD pump) (89200-798)
- RS232 retrofit kit (89200-800)
- tubing/insulation/hose clamps
- manifold kits (89200-828, 89200-830)
- fluids

Pilot Plants



Recommendations:

- VWR® Circulating Baths
- VWR® Refrigerated Recirculating (1/4 to 1HP) Chillers

- Size dependent
- Circulating baths come in refrigerated/heated, heat-only, and open tank models
- Chillers offer choice of pump and compressor size
- Depends on the pilot plant and its specific applications

Bundling Options

For Chillers

- external pressure reducer (PD or T pumps) (89200-796)
- external bypass (for MD pump chillers) (89200-798)
- RS232 retrofit kit (89200-800)
- tubing/insulation/hose clamps
- fluids

For Circulators

- tubing/insulation/hose clamps
- fluids

A pilot plant is a small-scale simulation of a larger plant (like a prototype) which is designed and operated to generate information about the behavior of the system for use in design of larger facilities. A variety of temperature control devices, like circulators and chillers, may be needed depending on the specific processes being tested.

Plasma Etching



Plasma etching technology can remove organic and inorganic contamination, increase wettability, increase bond strength, and remove residue. If effective surface treatment is critical to the efficiency of a process or the reliability of a product (like with treating semiconductor components such as wafers), plasma technology may be the answer.

Chillers, located in the support equipment chase, are recommended for this application as they provide the cooling necessary to regulate the temperature of the machinery.

Recommendations:

VWR® Refrigerated Recirculating (1/4 to 1HP) Chillers

- Size dependent
- Choice of compressor size

Recommend: Turbine Pump

- 1/4HP: 97044-090
- 1/3HP: 97044-094
- 1/2HP: 97044-098
- 3/4HP: 97044-102
- 1HP: 97044-106

Bundling Options

- ambient temperature sensor (89200-780)
- external pressure reducer (PD or T pumps) (89200-796)
- external bypass (MD pump) (89200-798)
- RS232 retrofit kit (89200-800)
- tubing/insulation/hose clamps
- manifold kits (89200-828, 89200-830)
- fluids

Polarimeter



A polarimeter is an instrument used to measure the angle of rotation of polarized light passing through an optical structure or sample. This can be used to check the purity of ingredients like starches and sugars. After preparation, many samples require cooling and this can be accomplished through the use of a refrigerated circulator.

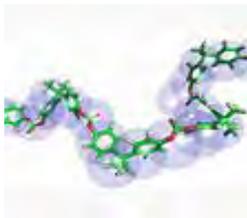
Recommendations:

VWR® Refrigerated Circulating Bath

Bundling Options

- fluids
- tubing/insulation/hose clamps
- connectivity
 - RS232 cable, 9' (89201-010)
 - Ethernet cable, 9' (89201-012)
 - USB-A to mini-B cable, 9' (89201-016)

Polymer Studies



This can involve the study of thermal annealing - determination of a polymer's properties at different temperatures.

Recommendations:

VWR® Heat Only Circulating Bath

Bundling Options

- fluids
- tubing/insulation/hose clamps
- connectivity
 - RS232 cable, 9' (89201-010)
 - Ethernet cable, 9' (89201-012)
 - USB-A to mini-B cable, 9' (89201-016)

Quick Cooling



Quick cooling is the process of rapidly cooling a sample. This has many applications and in each, it is very important to have temperatures well below 0°C and good flow rate. Generally, the lower the temperature the better.

VWR® Immersion Probe Coolers provide the low temperature required.

Recommendations: VWR® Immersion Probe Coolers

Reaction Vessel



A reaction vessel is normally a jacketed vessel of varying size (10 to 30 liters), used to contain the reactants in which a thermal reaction is occurring. A Chiller is used to control the vessel temperature by circulating a fluid throughout the vessel's jacketed surfaces.

Recommendations: VWR® Refrigerated Recirculating (1/4 to 1HP) Chillers

- Size dependent
- Choice of pump type (magnetic drive centrifugal, positive displacement, turbine)
- Choice of compressor size (1/4HP to 1HP)

Bundling Options

- external pressure reducer (PD or T pumps) (89200-796)
- external bypass (for MD pump chillers) (89200-798)
- RS232 retrofit kit (89200-800)
- tubing/insulation/hose clamps
- fluids

Reflux Extraction



Reflux extraction looks at the amount of bitumen (or asphalt) within a given pavement mixture. As it is a distillation technique, a sample is put in the bottom of the apparatus and then heat is applied so that components within the sample vaporize. The vapors move up the chamber and then are condensed back into a liquid. Eventually, the final condensed liquid is analyzed for the asphalt content.

A benchtop chiller provides the cooling required to condense the vapors.

Recommendations: VWR® Benchtop Chillers

Bundling Options

- base with locking casters (benchtop) (89200-794)
- tubing/insulation/hose clamps
- fluids

Refractometers



A refractometer is an instrument used to measure the refractive index (R.I.) of a substance. All materials refract light (alter its angle). The amount by which light is refracted is an important feature of every medium. The measure of a material's refractivity is known as its refractive index or R.I. Temperature plays a very important role in refractive index measurement and needs must be both precise and highly controlled.

Substances with a known refractive index at a specific temperature are more readily identified by maintaining the sample at the correct temperature with a Circulator.

Recommendations: VWR® Circulating Baths

Bundling Options

- fluids
- tubing/insulation/hose clamps
- connectivity
 - RS232 cable, 9' (89201-010)
 - Ethernet cable, 9' (89201-012)
 - USB-A to mini-B cable, 9' (89201-016)

Rotary Evaporators



Rotary evaporators (also called "rotovaps" in lab slang) are used to remove solvents from reaction mixtures and can accommodate volumes as large as three liters. While evaporation is possible without sample rotation, added benefits of rotary evaporators include bumping prevention and the formation of a thin film of warm solvent being spread over a large surface due to the centrifugal force and the frictional force between the wall of the rotating flask. The main components of a rotary evaporator are a vacuum system, consisting of a vacuum pump and a controller, a rotating evaporation flask, which can be heated in a heated fluid bath, and a water-cooled condenser with a condensate collecting flask. They are found in almost every organic laboratory. A chiller will help cool the vapor in the condenser, allowing faster collection of the components for further analysis or disposal.

Recommendations: VWR® Benchtop Chillers or Refrigerated Recirculating (1/4 to 1HP) Chillers

- Size dependent

Bundling Options

- base with locking casters (benchtop) (89200-794)
- external pressure reducer (PD or T pumps) (89200-796)
- external bypass (for MD pump chillers) (89200-798)
- RS232 retrofit kit (89200-800)
- tubing/insulation/hose clamps
- fluids

Sample Testing



Sample testing looks at the effects of temperature on samples to determine efficacy in real world applications. Samples can be cooled, heated, or ramped between hot and cold temperatures to learn what properties of the sample will be changed at what point. Viscosity testing is an example of sample testing.

Circulating Baths offer the required heating or cooling for the particular process.

Recommendations: VWR® Circulating Baths

Bundling Options

- fluids
- tubing/insulation/hose clamps
- connectivity
 - RS232 cable, 9' (89201-010)
 - Ethernet cable, 9' (89201-012)
 - USB-A to mini-B cable, 9' (89201-016)

Solvent Trapping



Solvent traps are designed to capture solvent vapors from extractions, often to comply with any safety requirements. For example, a possible source of contamination is oil from a pump that uses the oil either as working fluid or lubricant. Therefore, a solvent trap can be put at the start of the pump to collect any vapors.

An immersion probe cooler would be used to condense the vapors back into a liquid.

Recommendations:
Immersion Probe Cooler

Thawing Frozen Samples



While the process is self-explanatory in that the sample is being defrosted, there are differing techniques when changing a sample from a frozen state. Many frozen products can be steeped in a warm heated circulator for rapid thaw, while other, more fragile products need to be brought to temperature slowly at temperatures at or below ambient, with a refrigerated circulating bath.

Recommendations:
VWR® General Purpose Water Baths
or
VWR® Heated Circulating Baths

Bundling Options

- fluids
- tubing/insulation/hose clamps
- connectivity
 - RS232 cable, 9' (89201-010)
 - Ethernet cable, 9' (89201-012)
 - USB-A to mini-B cable, 9' (89201-016)

Viscosity Measurement



Viscosity is a measure of a fluid's resistance to flow. It describes the internal friction of a moving fluid. A fluid with high viscosity resists motion; a fluid with low viscosity flows easily. Precise temperature control is paramount as is traceability to temperature standard. For example increases of only 5 to 10°C can double the viscosity of a lubricant. Good circulation and uniformity of the bath are critical.

One example of viscosity measurement is **petroleum testing**. The VWR® Viscosity Bath with Standard Digital Controller is designed for such testing, and many other viscosity measurement procedures.

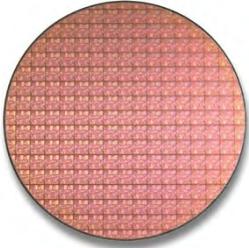
Recommendations:
VWR® Viscosity Baths
- Available with five round openings (89202-902) or three square openings (89202-906, pictured)
- SD Controller, stability of $\pm 0.04^\circ\text{C}$
- Unique configuration accommodates specific testing and quality control needs, including ASTM D-445.

VWR® Circulating Baths
7L with low-profile
MX Controller: 89202-958
Advanced Digital Controller: 89202-962

Bundling Options (for Circulating Baths)

- fluids
- tubing/insulation/hose clamps
- connectivity
 - RS232 cable, 9' (89201-010)
 - Ethernet cable, 9' (89201-012)
 - USB-A to mini-B cable, 9' (89201-016)

Wafer Polishing



Wafers are thinly sliced pieces of semiconductor material, often used in fabrication of micro circuits and other similar devices. A very important step in preparing the wafer for use is the polishing process. In this process, the wafer is given its requisite mirrored, flat surface by combining chemical slurry with a polishing pad and retaining ring using mechanical force to smooth out any defects.

The machinery used in wafer polishing generally requires a cooling element to maintain the machinery's temperature and dimensional stability of the wafer. This is where Chillers, generally located in the support equipment chase, are utilized to ensure proper functioning of the main machinery.



Recommendations: VWR® Refrigerated Recirculating (1/4 to 1HP) Chillers

- Size dependent
- Choice of compressor size

Recommend: Turbine Pump

- 1/4HP: 97044-090
- 1/3HP: 97044-094
- 1/2HP: 97044-098
- 3/4HP: 97044-102
- 1HP: 97044-106

Bundling Options

- tubing/insulation/hose clamps
- fluids

X-Ray Diffraction



X-Ray Diffraction is a type of scattering technique used to reveal information about a structure or composition. During this process, the X-Ray tube must be cooled.

Loss of cooling will trip a switch to immediately shut down the power supply. Therefore, Chillers (located with the unit) are used to cool the machinery's components and regulate temperatures to ensure proper operation.



Recommendations: VWR® Refrigerated Recirculating (1/4 to 1HP) Chillers

- Size dependent
- Choice of pump type and compressor size

Turbine Pump:

- 1/4HP: 97044-090
- 1/3HP: 97044-094
- 1/2HP: 97044-098
- 3/4HP: 97044-102
- 1HP: 97044-106

Bundling Options

- external pressure reducer (PD or T pumps) (89200-796)
- RS232 retrofit kit (89200-800)
- tubing/insulation/hose clamps
- fluids



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