Instruments for Measuring Temperature

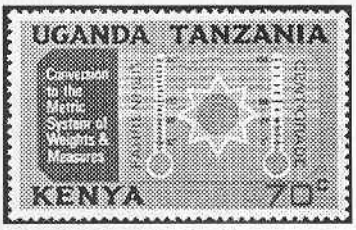
Thermometers on Stamps

Donald W. Hillger and Garry Toth

A number of stamps show thermometers. This is not unusual considering that the thermometer is a widely-used measuring device not only in science and industry, but also in everyday life. Most residences have either an indoor or an outdoor thermometer, or at least a thermostat to control their household heating and/or cooling equipment. Temperature is also one of the primary readings in weather reports and forecasts.

Temperature can be measured in numerous ways, but the expansion of metals or liquids is mainly used. Thermometers made from bimetallic strips are usually attached to a temperature dial or to a recording device. But the liquid-in-glass thermometer, which measures temperature by the expansion of liquid from a liquid-filled glass bulb into a partially-filled capillary tube, is the most common type of thermometer and is the focus of this article. Even without details the familiar cylinder and bulb shape can be identified on many of the stamps that will be mentioned.

With the invention of calibrated thermometers in the early 1700s, temperature began to be measured quantitatively rather than just qualitatively. Thermometers can be calibrated in different temperature scales. The most widely used scale throughout the world is the degree Celsius (°C) scale. This was first known as the degree centigrade scale until officially renamed in 1948. Virtually every country except the United States uses this as their primary temperature scale. In the U.S. shelter-level (surface) temperatures are reported to the public in degrees Fahrenheit (°F), but those temperatures are now routinely transmitted in degrees Celsius in order to be shared internationally. Unlike these surface temperatures, upper-air temperatures are measured and reported in degrees Celsius throughout the world.



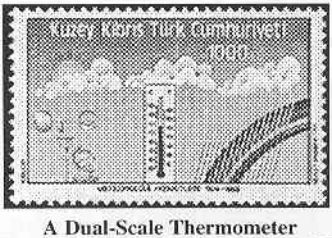
Fahrenheit and Celsius Thermometers
Kenya, Uganda and Tanzania (*Scott* 226)

For many scientific and industrial applications, absolute temperature is often used. An absolute temperature scale has the zero point at absolute zero, the hypothetical temperature characterized by the complete absence of heat energy, rather than utilizing negative temperatures. The most common absolute scale is the kelvin (K) scale (no longer called degrees kelvin), an extension of the degree Celsius scale down to absolute zero. The kelvin scale is more logical for many scientific applications but is not as handy for everyday use where it is reasonable to have a zero and small positive and negative numbers represent the range of temperatures encountered in everyday weather.

Stamps picturing thermometers can be placed into three groups. The first group pictures thermometers where the temperature scale or scales are easily discernable. A second group includes lifelike representations of thermometers, mostly used for weather reporting. Finally, a third group shows only the symbolic liquid-in-glass thermometer shape, the cylinder and bulb at one end.

In the first group, several stamps show thermometers with clearly readable scales,

Single-Scale Celsius Thermometer
Iraq (*Scott* 960)



A Dual-Scale Thermometer
Turkish Rep. of No. Cyprus (*Scott* 337)

Normal Body Temperature Recorded
Ghana (*Scott* 573)

with graduated scaling, or at least one readable temperature. Probably the best representations of thermometers on stamps are in conjunction with weather stamp issues. A stamp from the Turkish Republic of Northern Cyprus (*Scott* 337) issued in 1992 for the 18th anniversary of their Meteorological Office shows a dual-scale thermometer. Both the degree Celsius and degree Fahrenheit scales are easily readable. The thermometer is shown along with other meteorological instruments (an anemometer and a sunshine recorder) and weather symbols (clouds, rain, and a rainbow).

In 1980 Iraq issued a set of three stamps (*Scott* 959-961) with different denominations showing a single-scale degree Celsius thermometer and an anemometer. These stamps were issued for the 20th World Meteorological Day.

Another stamp from Kenya, Uganda, and Tanzania (*Scott* 226), one of a set of four issued in 1971 to publicize conversion to the metric system, shows two thermometers. The thermometer on the left has a degree Fahrenheit scale and the one on the right has a degree centigrade scale. As already mentioned the centigrade scale is now called the Celsius scale having been renamed long before this stamp was issued.

Fever thermometers are also shown on a few stamps. In 1976 Ghana issued a stamp (*Scott* 573) also for the introduction of the metric system into their country. Degree Celsius temperatures are given at 0°C for ice and 100°C for boiling water. The liquid-in-glass instrument is a fever thermometer with the normal body temperature given as an even 37°C which converts exactly into 98.6°F, a value familiar to most Americans.

Dual-Scale Fever Thermometer
Great Britain (*Scott* 1130)

Inventor of the Centigrade Scale
Sweden (*Scott* 1402)

Great Britain issued a stamp (*Scott* 1130) in 1986 for Industry Year showing a medical research laboratory and a portion of a dual-scale fever thermometer. The 37°C/98.6°F normal body temperature is clearly shown. Next, although the stamp from Australia (*Scott* 542) issued in 1973 does not show a thermometer, elevated body (fever) temperatures are given as 38°C and 100°F. This is one of four stamps that used a cartoon-type character to promote Australia's conversion to the metric system.

Three other stamps show limited thermometer scales. In 1982 Sweden issued a stamp (*Scott* 1402) to honor Anders Celsius the inventor of the centigrade/Celsius scale. The thermometer pictured shows a temperature of 0°C. Also, two surtax stamps from the Netherlands (*Scott* B650-B651) issued in 1990 show thermometer scales, although it is not clear what temperature the liquid column is supposed to be without numbers on the scales. The additional tax values on each stamp may indicate the temperature in degrees Celsius.

In 1999 the United States issued four stamps featuring aquarium fish. One of the stamps (*Scott* 3318) shows a dual-scale aquarium thermometer where the degree Fahrenheit and degree Celsius scales are just discernable.

The next group of stamps to be covered are those showing lifelike images of thermometers. Probably the best representation of

Dual-Scale Aquarium Thermometer
U.S.A. (*Scott* 3318)

Measuring Relative Humidity
Namibia (*Scott* 692)

Thermometers in Stevenson Screen
Gilbert and Ellis (*Scott* 218)

weather thermometers on stamps comes from Namibia (*Scott* 692) issued in 1991 for the centenary of the Namibian Weather Service. Shown is the inside of a Stevenson screen, as it is commonly called in most British Commonwealth countries. This type of weather instrument shelter is fairly standard around the world for weather measurements, usually a wooden box painted white with louvered sides to allow the free flow of air. As a well-ventilated box, mounted at a standard height, it provides protection from precipitation and from the sun for the thermometers inside. The shelter allows temperature readings in the shade, as readings in direct sunlight are often highly inflated and are not reliable.

The four thermometers on the right side of the Namibia stamp include a minimum and a maximum thermometer to record the daily low and high temperatures. These are the thermometers that are mounted horizontally. The other two vertically-mounted thermometers are dry- and a wet-bulb thermometer. The dry-bulb reading is the normal temperature. The wet-bulb theremometer can be seen with a wick from the bulb hanging into a container of water. The container has a constant supply of water to keep the bulb wet as the water evaporates. The thermometer gives a wet-bulb temperature reading, a lower than normal temperature due to the cooling effect of the evaporating water, a reading that indicates the amount of humidity in the air. The lower the humidity the more water that can evaporate and the lower the wet-bulb temperature, and conversely the higher humidity the less water that can evaporate and the higher the wet-bulb temperature. When the two temperatures are the same the relative humidity is 100 percent; when the two temperatures are different the two values can be used to determine the humidity. A recording thermohygrograph with two pens and two traces sits to the left of the thermometers.

Two stamps from Gilbert and Ellice Islands (*Scott* 218-219, two different views) issued in 1973 for the centenary of the World Meteorological Organization also show four thermometers in a Stevenson screen. In this case all four thermometers are mounted horizontally. They are most likely the same four types of thermometers as on the Namibia stamp, although there is no indication of a wet bulb on any of them. The second stamp is a view similar to the first stamp but from farther away.

A stamp from Mozambique (*Scott* 1105) issued in 1989 also shows the inside of an instrument shelter. Although the details are not good, there appear to be at least two thermometers and a thermograph in the shelter. In a stamp from Uganda (*Scott* 1197) issued in 1993 for the 33rd World Meteorological Day the instrument shelter is open for taking readings. The description on the stamp says that temperature is being read although no thermometer is seen. Two other stamps in the same Uganda set (*Scott* 1194 and 1198, two different views) show an automatic weather station that records temperatures without the need for a human to read the instruments. In the second stamp, with the closer view, the temperature sensor can be seen as the left-most device on the second row from the top. It is a louvered cylinder typically containing both a temperature and a humidity sensor. A souvenir sheet (*Scott* 1200) issued with the same set shows a minimum-maximum thermometer in the lower-right corner. This complex thermometer can be used to measure both the lowest and highest daily temperatures. Also shown on the souvenir sheet are a barograph, a hygrometer, and a recording thermograph with a temperature trace, all clearly labeled.

A stamp from New Zealand (*Scott* 794) issued in 1984 for Antarctic research shows

Taking Readings from Open Shelter
Uganda (*Scott* 1197)

Improper Reading of Temperature
China Peoples Republic (*Scott* 1516)

the launching of an instrumented weather balloon, but in the background is a person reading the instruments in a Stevenson screen. As with the stamp from Mozambique, the details of the inside of the instrument shelter are not good, but one can infer the presence of thermometers and a recording thermograph.

Two more stamps show instrument shelters and thermometers. In a stamp from Upper Volta (*Scott* 95) issued in 1962 for the Second World Meteorological Day, a miniature symbolic thermometer shape with no details appears on the side of the instrument shelter. And from Mainland China a stamp (*Scott* 1516) issued in 1979 shows a girl holding a thermometer from an instrument shelter. This is an inappropriate way to read a shelter temperature. Normally the thermometers are fastened and are read without removing or touching them in order to not disturb the readings.

Many other weather-related stamps show instrument shelters, but with one exception only shelters with actual instruments have been mentioned, especially those with visible thermometers.

Besides the stamps showing weather thermometers, there are other stamps showing lifelike thermometers. Thermometers are shown on three nearly identical stamps, with different denominations and colors, from Colombia (*Scott* 680, C309-C310) issued in 1958 for the International Geophysical Year and honoring the scientist Francisco Jose de Caldas. On each stamp is the hypsometer he invented to determine altitude by the decrease in the boiling temperature of water with increased height (decreased atmospheric pressure). A long thermometer sticks out of the boiling container shown in each stamp.

Determining Altitude with Hypsometer
Colombia (*Scott* 680)

Thermometer Symbolizes Conservation
Spain (*Scott* 2136)

Finally to be covered are a group of stamps showing only symbolic liquid-in-glass thermometer shapes, a cylinder connected to a bulb at one end. There are four stamps displaying this type of thermometer. From Spain are two stamps (*Scott* 1487 and 2136) issued in 1967 and 1979 respectively. The first stamp shows a thermometer and a snowflake for the 12th International Refrigeration Congress in Madrid. The second stamp from Spain shows a symbolic thermometer and an insulated house to promote energy conservation.

A stamp from New Zealand (*Scott* 594) issued in 1976 shows a symbolic thermometer along with other mass and length symbols to promote their change to the metric system. The last stamp with symbolic thermometer shape is from Malagasy (*Scott* 1062) issued in 1992 for the centenary of meteorology in that country. The stamp shows a weather map over the Island of Madagascar with isobars. Also shown are two thermometers, one recording 25°C south of the weather front and the other recording 35°C to the north. Remember that

Weather Map with Thermometers
Malagasy (*Scott* 2136)

this is south of the equator where cooler air normally comes from farther south, not from the north.

Images of thermometers are not limited to stamps. The cancellation on the FDC issued by the French Southern and Antarctic Territory on March 27, 1970, shows a nice symbolic liquid-in-glass thermometer. The cover and its stamp (*Scott* C19) commemorate the 20th anniversary of weather observing on Amsterdam Island in the Indian Ocean.

Many of the stamps mentioned in this article are related to the topic of weather or conversion to the metric system. There may be other stamps that show thermometers as well. If readers know about other stamps for this topic the authors would appreciate hearing about them.

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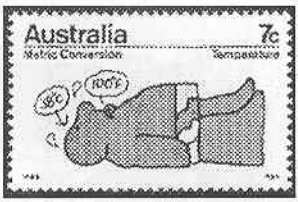

This Bloke Has a Fever
Australia (*Scott* 542)

Metric system temperature. (http://lamar.Colo State.edu/~hillger/temps.htm)

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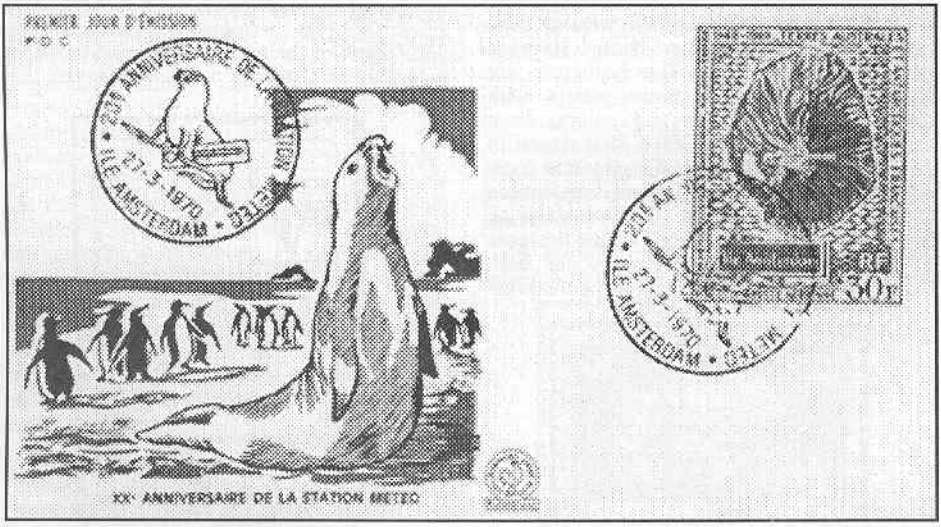

Walrus Carries Symbolic Liquid-in-glass Thermometer
French Southern and Antarctic Territory (*Scott* C19)