Rankine scale

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The **Rankine scale** (/ˈræŋkɪn/) is an absolute scale of thermodynamic temperature named after the Glasgow University engineer and physicist William John Macquorn Rankine, who proposed it in 1859. (The Kelvin scale was first proposed in 1848.)[1] It may be used in engineering systems where heat computations are done using degrees Fahrenheit.

The symbol for **degrees Rankine** is °R[2] (or °Ra if necessary to distinguish it from the Rømer and Réaumur scales). By analogy with kelvin, some authors term the unit *rankine*, omitting the degree symbol.[3][4] Zero on both the Kelvin and Rankine scales is absolute zero, but a temperature difference of one Rankine degree is defined as equal to one Fahrenheit degree, rather than the Celsius degree used on the Kelvin scale. A temperature of −459.67 °F is exactly equal to 0 °R.

The US National Institute of Standards and Technology recommends against using the degree symbol when citing Rankine in NIST publications.[2]

Rankine temperature conversion formulae

	from Rankine	to Rankine
Celsius	[°C] = ([°R] − 491.67) × $5/9$	[°R] = ([°C] + 273.15) × $9/5$
Fahrenheit	[°F] = [°R] − 459.67	[°R] = [°F] + 459.67
Kelvin	[K] = [°R] × $5/9$	[°R] = [K] × $9/5$

For temperature *intervals* rather than specific temperatures,
1 °R = 1 °F = $5/9$ °C = $5/9$ K

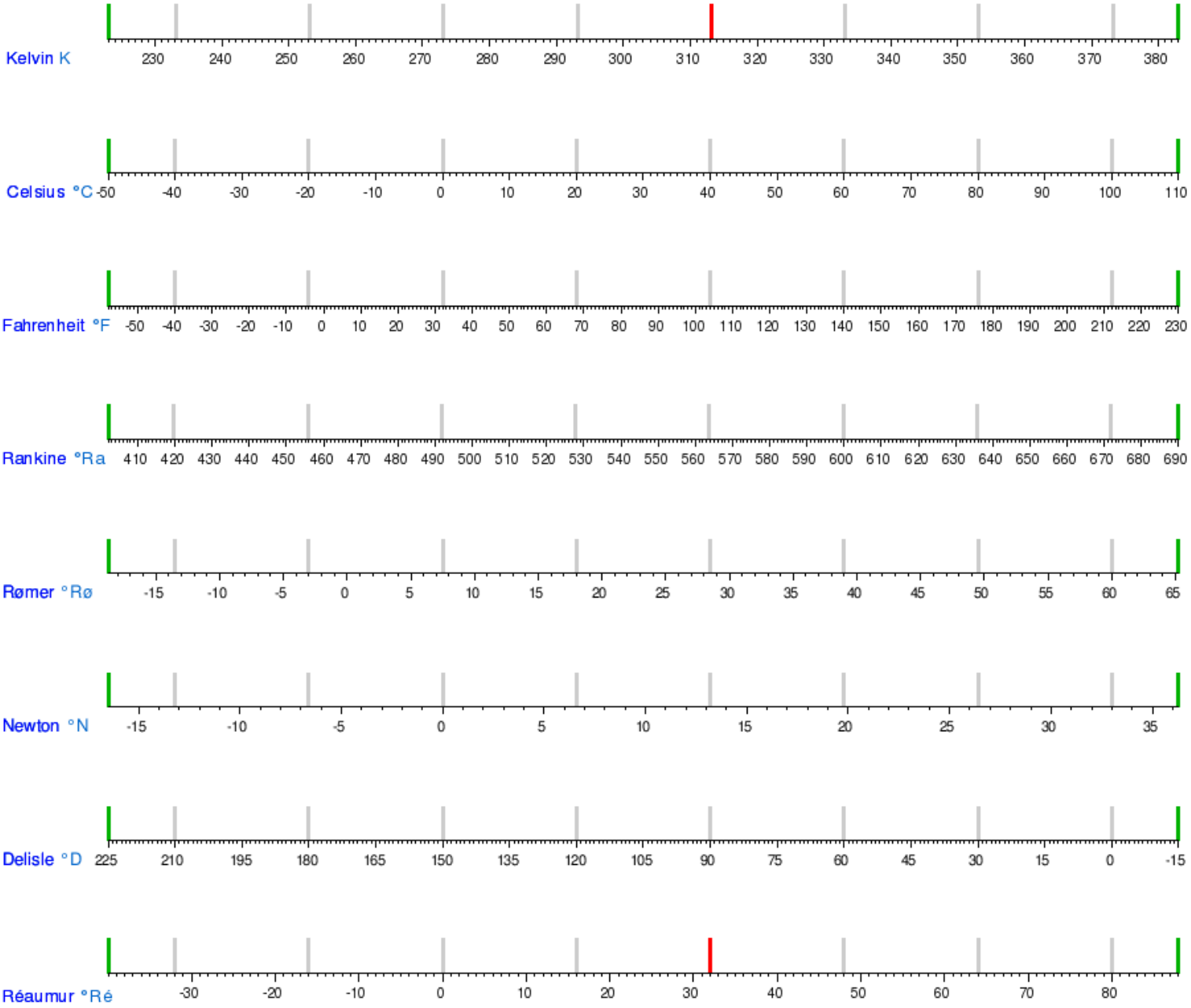
Comparisons among various temperature scales

Some important temperatures relating the Rankine scale to other temperature scales are shown in the table below.

	Kelvin	Celsius	Fahrenheit	Rankine
Absolute zero (by definition)	0 K	−273.15 °C	−459.67 °F	0 °R
Freezing point of brine (by definition (on Fahrenheit scale only))	255.37 K	−17.78 °C	0 °F	459.67 °R
Freezing point of water[5]	273.15 K	0 °C	32 °F	491.67 °R
Triple point of water (by definition)	273.16 K	0.01 °C	32.018 °F	491.688 °R
Boiling point of water[6]	373.1339 K	99.9839 °C	211.97102 °F	671.64102 °R

Contents

Conversion table between the temperature units



313.15 K = 40 °C = 104 °F = 563.67 °Ra = 28.5 °Rø = 13.2 °N = 90 °D = 32 °Ré

See also

- Comparison of temperature scales

Notes and references

1. http://www.merriam-webster.com/dictionary/rankine
2. B.8 Factors for Units Listed Alphabetically (http://physics.nist.gov/Pubs/SP811/appenB8.html) from Guide for the Use of the International System of Units (SI) (http://physics.nist.gov/Pubs/SP811/contents.html), NIST Special Publication 811, 2008 edition, Ambler Thompson and Barry N. Taylor
3. Pauken, Michael (2011). *Thermodynamics For Dummies*. Indianapolis: Wiley Publishing Inc. p. 20. ISBN 978-1-118-00291-9.
4. Balmer, Robert (2011). *Modern Engineering Thermodynamics*. Oxford: Elsevier Inc. p. 10. ISBN 978-0-12-374996-3.
5. The ice point of purified water has been measured to be 0.000089(10) degrees Celsius – see Magnum, B.W. (June 1995). "Reproducibility of the Temperature of the Ice Point in Routine Measurements" (http://www.cstl.nist.gov/div836/836.05/papers/magnum95icept.pdf) (PDF). *Nist Technical Note*. **1411**. Retrieved 2007-02-11.
6. For Vienna Standard Mean Ocean Water at one standard atmosphere (101.325 kPa) when calibrated solely per the two-point definition of thermodynamic temperature. Older definitions of the Celsius scale once defined the boiling point of water under one standard atmosphere as being precisely 100 °C. However, the current definition results in a boiling point that is actually 16.1 mK less. For more about the actual boiling point of water, see VSMOW in temperature measurement.

External links