CCT Working Group for Humidity (WG-Hu) Highlights report to the CCT 2026 meeting

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BIPM, 21 May 2026

CCT Working Group for Humidity (WG-Hu)

Terms of Reference:

- to advise the CCT on matters relating to humidity;
- to pursue harmonization relevant to the field of humidity measurements;
- to develop and maintain an effective liaison with the international humidity and moisture community.

Tasks:

- operation of CCT-K6 and CCT-K8;
- strategic planning of ongoing and future key and supplementary comparisons in the field;
- draft a document on uncertainty in humidity;
- clarification of quantities, units, symbols and realizations relating to humidity measurement.

CCT WG-Hu membership

- CENAM (Mexico); E+E (Austria); INMETRO (Brazil); INRIM (Italy); INTA (Spain); KRISS (Republic of Korea); LNE-CETIAT (France); MIKES (Finland); MSL (New Zealand); NIM (China); NIST (USA); NMC, A*STAR (Singapore); NMIA (Australia); NMIJ/AIST (Japan); NMISA (South Africa); NPL (UK); PTB (Germany); UME (Turkey); VNIIFTRI (Russia); VSL (Netherlands); IAPWS (Co-opted member)

Hello to: Stefaan Janssens (MSL), Bruno Mascarenhas Lozano (INMETRO), Allan Harvey (IAPWS)

Progress on tasks

Key comparisons

Comparison	Range	Pilot/Co-Pilot	Status
CCT–K8	+30 ℃ to +95 ℃	INTA/NIST	Approved for equivalence
EURAMET.T-K8	+30 ℃ to +95 ℃	PTB/E+E	Approved for equivalence
CCT-K6.2021	-50 ℃ to +20 ℃	E+E/VSL	Protocol in preparation
EURAMET.T-K6.2021	-50 ℃ to +20 ℃	E+E/VSL	Protocol in preparation
APMP.T-K6.2013	-50 ℃ to +20 ℃	NMC, A*STAR/NMIJ	Draft A

Progress on tasks

CMC review protocol for humidity, working with WG-CMC

- under revision aiming to reduce the workload of CMC review
- Considering adaptations to review criteria, to reduce effort of comparisons

Liaison activities

- WG-Hu convenes ISHM
- Liaison with CCQM (moisture measurement), WMO, IAPWS, and others

Digitalization

- Discussion of digitalization for essential humidity function
  - Saturation vapor pressure of water
  - Water vapor enhancement factor
- Test of prototype API for water vapor enhancement factor

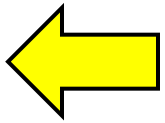
Progress on tasks

WG-Hu Members' research

- Metrological infrastructure for trace-moisture measurement in gases (PROMETH$_2$O)
- Hygrometers based on laser spectroscopy
- Compact humidity generators

Humidity quantities, units, symbols and realizations

- Version 1 document will be finalized
- Proposal of use of "%rh" from WG-Hu to CCT



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Unit symbol for relative humidity

Meeting of CCT-WG-SP, May 2026

Stephanie Bell, Vito Fernicola, Hisashi Abe, and members of CCT-WG-Hu

%rh as a unit symbol

To cover:

Our *de facto* unit symbol %rh – the issues

Our recommendation – the current status

Position in the SI, or outside the SI

Possible way forward

%rh as a unit symbol – the issues

The unofficial unit symbol “%rh” (or variants of it) is:

- already a globally used *de facto* unit symbol - but not universally
- used by all major relative humidity instrument companies, but not consistently
- used by many NMIs, accreditation bodies and other authorities.

The %rh symbol is useful, and needed, to distinguish values of relative humidity from other humidity quantity percentages, such as fraction of water vapour in air (mass fraction or volume fraction).

However, language variants, capitalisations not standardised (%rh, %RH, %rF, %UR ...)

Note: defining the unit symbol does not depend on the exact definition of the unit, or of the variable symbol.

%rh as a unit symbol

Our aim:

To gain support for the use of %rh as the unit symbol for quantity values of percent relative humidity

What we did

- CCT-WG-Hu drafted a CCT recommendation on this
- Discussion with CCT President (WG-SP chair) … emails …
- Current position – a CCT recommendation on this (to the CIPM or alternatively to the CCU) *will not be accepted* … not currently, anyway.

Where we are now

- A recommendation from WG-Hu addressed to the CCT

%rh unit symbol in the SI

The difficulty about the proposed unit symbol %rh:

In principle, the quantity relative humidity is “dimensionless”, of dimension one (unit symbol 1, usually unwritten).

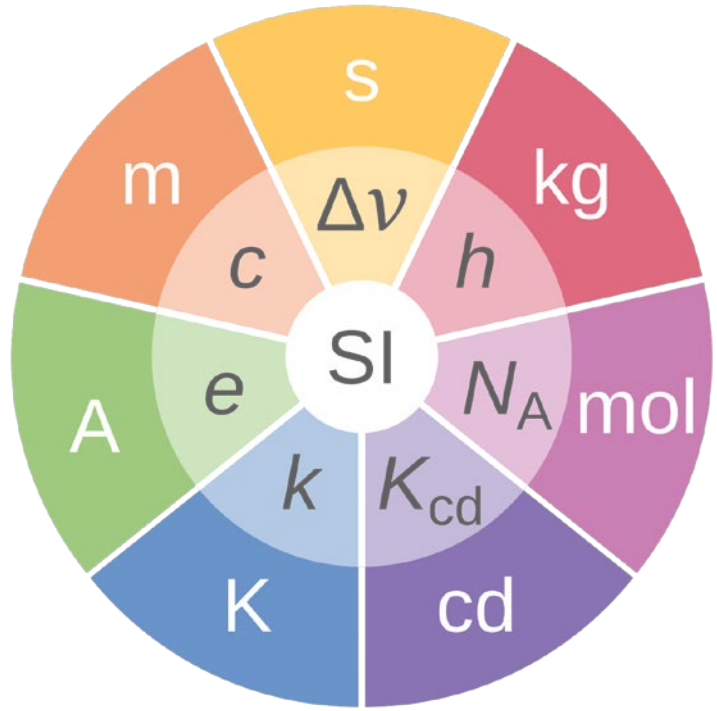
In theory, quantities of dimension one are already handled well in the SI

- *actually, maybe not*
- extensive Metrologia literature on inadequacy of unit symbol 1 for many quantities (or for any!)

In theory, a unit symbol must not contain a reference to the measurand

- *actually, yes and no….*

But the SI can (and does) make exceptions to the rules, by choice. Various examples, such as the degree Celsius (°C).



%rh unit symbol – not in the SI

In fact, our proposal is not for inclusion in the SI (neutral on this possibility).

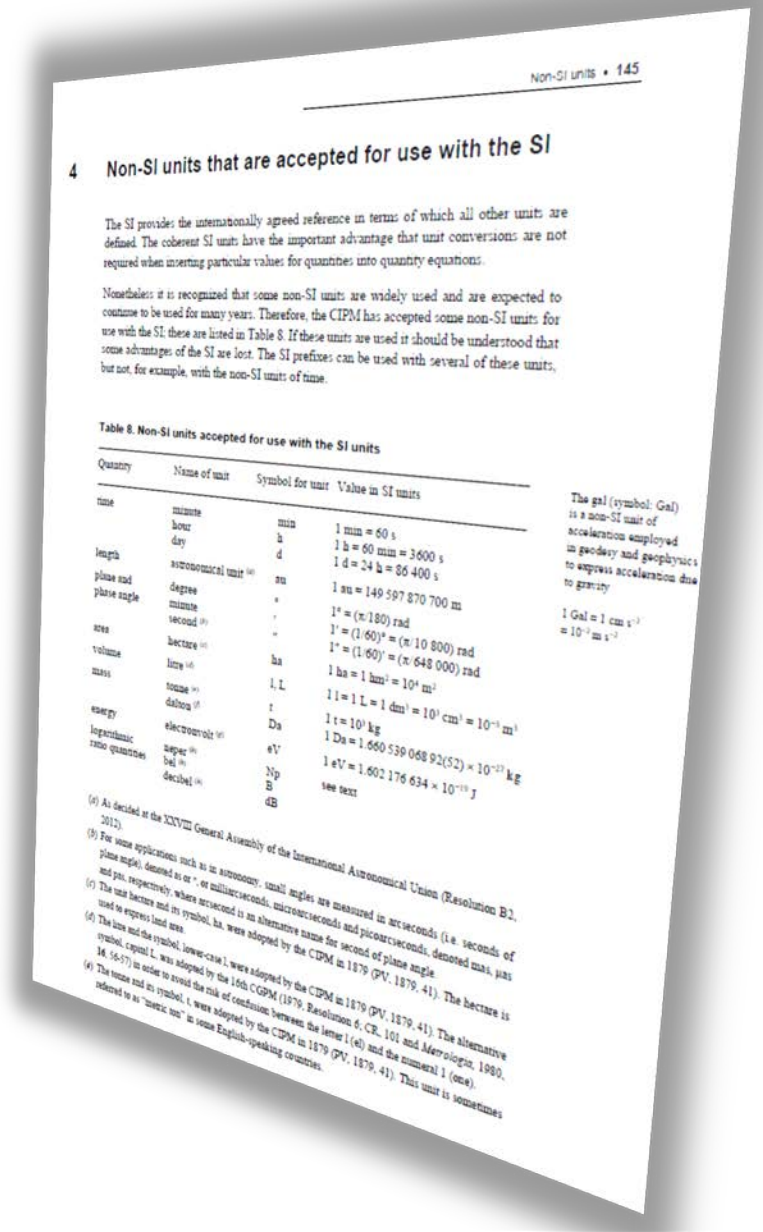
We only want to

- recognise the *de facto* unit symbol that is in widespread use for good reasons
- harmonise its notation (English language version, lower case).

As a ***recommendation***: users would not need to adopt this, but it would guide them on which version is preferred.

Although ...recognition of non-SI units/symbols is well established (Table 8 in SI brochure), for example:

- time in days (symbol d)
- electronvolt (symbol eV)
- logarithmic ratio quantities – decibel (symbol dB)



Non-SI units • 145

4 Non-SI units that are accepted for use with the SI

The SI provides the internationally agreed reference in terms of which all other units are defined. The coherent SI units have the important advantage that unit conversions are not required when inserting particular values for quantities into quantity equations.

Nonetheless it is recognized that some non-SI units are widely used and are expected to continue to be used for many years. Therefore, the CIPM has accepted some non-SI units for use with the SI; these are listed in Table 8. If these units are used it should be understood that some advantages of the SI are lost. The SI prefixes can be used with several of these units, but not, for example, with the non-SI units of time.

Table 8. Non-SI units accepted for use with the SI units

Quantity	Name of unit	Symbol for unit	Value in SI units
time	minute	min	1 min = 60 s
	hour	h	1 h = 60 min = 3600 s
	day	d	1 d = 24 h = 86 400 s
length	astronomical unit [a]	au	1 au = 149 597 870 700 m
plane and phase angle	degree	°	$1° = (\pi/180)$ rad
	minute	′	$1′ = (1/60)° = (\pi/10\,800)$ rad
	second [b]	″	$1″ = (1/60)′ = (\pi/648\,000)$ rad
area	hectare [c]	ha	1 ha = 1 hm^2 = 10^4 m^2
volume	litre [d]	l, L	1 l = 1 L = 1 dm^3 = 10^3 cm^3 = 10^{-3} m^3
mass	tonne [e]	t	1 t = 10^3 kg
	dalton [f]	Da	1 Da = 1.660 539 068 92(52) × 10^{-27} kg
energy	electronvolt [g]	eV	1 eV = 1.602 176 634 × 10^{-19} J
logarithmic ratio quantities	neper [h]	Np	see text
	bel [h]	B	
	decibel [h]	dB	

The gal (symbol: Gal) is a non-SI unit of acceleration employed in geodesy and geophysics to express accelerations due to gravity

1 Gal = 1 cm s^{-2} = 10^{-2} m s^{-2}

(a) As decided at the XXVIII General Assembly of the International Astronomical Union (Resolution B2, 2012).

(b) For some applications such as in astronomy, small angles are measured in arcseconds (i.e. seconds of plane angle), denoted as or ″, or milliarcseconds, microarcseconds and picoarcseconds, denoted mas, μas and pas, respectively, where arcsecond is an alternative name for second of plane angle.

(c) The unit hectare and its symbol, ha, were adopted by the CIPM in 1879 (PV, 1879, 41). The hectare is used to express land area.

(d) The litre and the symbol, lower-case l, were adopted by the CIPM in 1879 (PV, 1879, 41). The alternative symbol, capital L, was adopted by the 16th CGPM (1979, Resolution 6; CR, 101 and *Metrologia*, 1980, **16**, 56-57) in order to avoid the risk of confusion between the letter l (el) and the numeral 1 (one).

(e) The tonne and its symbol, t, were adopted by the CIPM in 1879 (PV, 1879, 41). This unit is sometimes referred to as "metric ton" in some English-speaking countries.

%rh unit symbol – possible way forward

Others are addressing similar cases

- CCQM have bioanalytical measurands of dimension one that they want to better distinguish (cells, copies, colony-forming units, virus particles etc).
- Working on harmonising these cases (recognising that they are outside the SI)
- exploring localised usage and potential standardisation

We could do similar (learn from their case?) A next action for WG-Hu?

For now, our recommendation is from WG-Hu addressed to CCT:

- that the unit symbol %rh be used to express quantity values of percent relative humidity.

PROPOSAL OF THE WORKING GROUP FOR HUMIDITY SUBMITTED TO THE CONSULTATIVE COMMITTEE FOR THERMOMETRY

PROPOSAL (2026)

Harmonisation of the unit symbol for relative humidity

The Working Group for Humidity in the Consultative Committee for Thermometry (CCT), at its 32nd meeting in 2026,

recognising that

- relative humidity is one of the quantities most widely and commonly used to express humidity in science, industry, and society at large;
- the SI Brochure and the International Vocabulary of Metrology (VIM) emphasise the importance of unambiguous definition and clear communication of quantities and units;

PROPOSAL OF THE WORKING GROUP FOR HUMIDITY SUBMITTED TO THE CONSULTATIVE COMMITTEE FOR THERMOMETRY

noting that

- relative humidity is defined as the quotient z / $z_{\square a \square}$ of a humidity variable z at the prevailing conditions and the same variable $z_{\square a \square}$ at saturation, at the same temperature and pressure; z and $z_{\square a \square}$ may be, among others, water vapour partial pressures or water vapour amount fractions;
- the assignment of a unit symbol to relative humidity does not depend on a particular version of the definition;
- primary relative humidity is realised in terms of thermodynamic equilibrium at a phase boundary of water, the scale being established by subdivision of the realised unit, and being a rational scale;
- relative humidity is a dimensionless quantity, conventionally and frequently expressed as a percentage;
- several symbols are currently used in practice to express relative humidity, including %, %RH, and %rh;
- the language variations in use (such as %r.F. in German, %UR in Italian, %HR in French and Spanish) require harmonisation;
- other dimensionless quantities are also used to express humidity, such as amount fraction, volume fraction, and mass fraction, for which the symbol % is often used;

PROPOSAL OF THE WORKING GROUP FOR HUMIDITY
SUBMITTED TO THE CONSULTATIVE COMMITTEE FOR THERMOMETRY

considering that

- the use of the symbol % without clarification can lead to ambiguity between relative humidity and other dimensionless humidity quantities;
- clear and harmonised notation is essential for international metrology, calibration documentation, and scientific communication;
- the unit symbol notation %rh (or %RH, or language-specific forms) is already in widespread use among NMIs, accredited calibration laboratories, instrument manufacturers, and sector documentary standards as a practical convention to identify unambiguously that the quantity being expressed is relative humidity;

proposes

- that the unit symbol **%rh** be used to express quantity values of percent relative humidity.

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