# Units for CCAUV

[Acoustics, Ultrasound and Underwater Acoustics]

ISO 80000 consists of the following parts, under the general title *Quantities and units*:

— *Part 1: General*
— *Part 2: Mathematics*
— *Part 3: Space and time*
— *Part 4: Mechanics*
— *Part 5: Thermodynamics*
— *Part 7: Light and Radiation*
— *Part 8: Acoustics*
— *Part 9: Physical chemistry and molecular physics*
— *Part 10: Atomic and nuclear physics*
— *Part 11: Characteristic numbers*
— *Part 12: Condensed matter physics*

IEC 80000 consists of the following parts, under the general title *Quantities and units*:

DRAFT INTERNATIONAL STANDARD

# ISO/DIS 80000-8

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2017-10-05

# Quantities and units —

## Part 8:
## Acoustics

*Grandeurs et unités —*

*Partie 8: Acoustique*

ICS: 01.060

| Item No. | Quantity | | | Unit | Remarks |
|---|---|---|---|---|---|
| | Name | Symbol | Definition | Symbol | |
| 8-15 (*8-22*) | sound pressure level, SPL | $L_p$ | $L_p \equiv 10\,\lg\frac{p_{\mathrm{rms}}^2}{p_0^2}$ dB where $p_{\mathrm{rms}}$ is the root-mean-square sound pressure and $p_0$ is the reference sound pressure. For sound in air and other gases, the reference sound pressure is given by $p_0 = 20$ μPa. For sound in water and other liquids, the reference sound pressure is given by $p_0 = 1$ μPa. | dB | Sound pressure level is the level of the power quantity $p_{\mathrm{rms}}^2$. It is expressed in decibels (dB).<br>For a general definition of the level of a power quantity, see ISO 80000-3. |
| 8-16 (*8-23*) | sound power level, SWL | $L_W$ | $L_W \equiv 10\,\lg\frac{W_{\mathrm{m}}}{W_0}$ dB where $W_{\mathrm{m}}$ is mean sound power (item 8-9) and the reference sound power is $W_0 = 1$ pW | dB | Sound power level is the level of the power quantity $W_{\mathrm{m}}$. It is expressed in decibels (dB).<br>For a general definition of the level of a power quantity, see ISO 80000-3. |

# Acoustics, Ultrasound and Underwater Acoustics

The primary quantity is sound pressure, defined as the difference between instantaneous total pressure and static pressure. The SI unit of sound pressure is the pascal (Pa).

Sound pressure is often expressed as a Sound Pressure Level (SPL) in decibels, $L_p$ , calculated from:

$$L_P = 10 \log \frac{p_{rms}^2}{p_0^2} \text{ dB}$$

where $p_{\text{rms}}$ is the root-mean-square sound pressure and $p_0$ is the reference value of sound pressure.

For sound in air and other gases, the reference sound pressure is given by $p_0$ = 20 µPa.

For sound in water and other liquids, the reference sound pressure is given by $p_0$ = 1 µPa.

Ref: ISO 80000: Quantities and units — Part 8: Acoustics

The SI unit of the sound power is the watt (W).

Note that in ultrasound metrology, sound power is often referred to as ultrasound power.

In air acoustics, sound power is sometimes expressed as sound power level in decibels calculated from

$$L_W = 10 \log \frac{W_m}{W_0} \text{ dB}$$

where $W_m$ is mean sound power and $W_0$ is the reference value of sound pressure. The reference value for sound power is $W_0$ = 1 pW

Ref: ISO 80000: Quantities and units — Part 8: Acoustics

## 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 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 | $1\ Da = 1.660\,538\,86\,(28) \times 10^{-27}\ kg$ |
| energy | electronvolt [g] | eV | $1\ eV = 1.602\,176\,565 \times 10^{-19}\ J$ |
| logarithmic ratio quantities | neper [h] | Np | see text |
| | bel [h] | B | |
| | decibel [h] | dB | |

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| area | hectare [c] | ha | $1\ \text{ha} = 1\ \text{hm}^2 = 10^4\ \text{m}^2$ |
| volume | litre [d] | l, L | $1\ \text{l} = 1\ \text{L} = 1\ \text{dm}^3 = 10^3\ \text{cm}^3 = 10^{-3}\ \text{m}^3$ |

(*h*) In using these units it is important that the nature of the quantity be specified, and that any reference value used be specified. These units are not SI units, but they have been accepted by the CIPM for use with the SI.

| | | | |
|---|---|---|---|
| logarithmic ratio quantities | neper [h] | Np | see text |
| | bel [h] | B | |
| | decibel [h] | dB | |