International Standard 6426/1

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Horological vocabulary — Part 1 : Technical and scientific definitions

Vocabulaire horloger — Partie 1 : Définitions technico-scientifiques

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

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It has been approved by the member bodies of the following countries :

Australia	Japan
Czechoslovakia	Romania
Egypt, Arab Rep. of	Spain
France	Switzerland
India	USSR

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Germany, F.R.
United Kingdom

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Horological vocabulary — Part 1 — Technical and scientific definitions

1 Scope and field of application

This part of ISO 6426 defines the principal technical and scientific terms used in the horological industry. These definitions apply to time-measuring instruments or to related devices.

A table summarizing the values and units of measurement associated with the definitions is given at the end of this part of ISO 6426.

NOTE — The definitions of technical and commercial terms will form the subject of a future International Standard.

2 Reference

ISO 31/1, *Values and units of space and time.*

3 Definitions

The order in which the terms are given is a logical order, without any intention of classification and the numbering of the definitions does not indicate any scale of importance.

1 time : Undefined medium in which existing objects appear to develop irreversibly in the changes which they undergo, and in which events and phenomena appear to occur in their succession.

To this medium corresponds a quantity t allowing, over a time scale, the chronological order of events.

2 date (h or H) : In the physical sense, the *date of an event*, related to the time scale associated with a time-keeping instrument, is the *mark* of the precise instant (h_i) where it appears in the completely ordered chronological sequence of the successive indications displayed by this instrument.

In a uniform time scale, of which the origin has been suitably chosen, the succession of dates h as a function of the continually increasing parameter t may be described by the relation :

$$h = \lambda t - h_o \qquad \ldots (1)$$

NOTE — λ represents a factor which relates to the choosen unit.

3 duration (t, τ) : The *duration* τ of an *interval of time* (h_j, h_i), defined *in a given time scale*, is the difference

$$\tau = h_j - h_i \qquad \ldots (2)$$

in the dates, taken in this order, of the end of the interval (h_j) and the beginning of it (h_i).

NOTE — In a uniform time scale, by applying formula (1), the expression of the duration is given by the relation :

$$\tau = \lambda (t_j - t_i) \qquad \ldots (3)$$

or even more simply, if $\lambda = 1$, that is if the uniform time scale serves as a *reference* :

$$\tau = t_j - t_i \qquad \ldots (4)$$

In this case, there is a pure and simple identity between h and t when the indices agree and the unit of duration is the second as defined in the international system (SI). If, in addition, the indices are themselves chosen from a completely ordered whole and if $j > i$, then $t_j > t_i$ and $\tau > 0$. The date (h_i) is prior to (h_j).

4 state (E) **of an instrument at the instant** t_i : The difference at a precise marked instant t_i, between the date h_i which it indicates and the reference date H_i

$$E_i = h_i - H_i \qquad \ldots (5)$$

The unit of the state is the second.

NOTE — If there is direct access to a reference scale of time maintained by a standard clock for the purpose of marking a date H, the checking of a time-keeping instrument maintaining its own scale of time h by comparison with the standard consists of dating, that is by simultaneously marking the same event in two scales of time.

When a difference in dates is established $(h - H)_i$:

— the instrument to be checked has gained in relation to the standard clock if $E_i > 0$;

— the instrument to be checked has lost in relation to the standard clock if $E_i < 0$.

5 instrumental correction (C) : The correction of the date which should be made algebraically to the hour read as h_i to obtain the reference hour H_i at the instant t_i.

$$C_i = - E_i = H_i - h_i \qquad \ldots (6)$$

This correction is negative if the instrument gains and positive if it loses in relation to the standard clock.

The unit of instrumental correction is the second.

6 rate (M_τ) of an instrument for the duration τ of an interval of time marked at the instants t_j and t_i : The ratio of the variation of the state in a duration τ to the value of this duration. This is a dimensionless quantity.

$$M_\tau = \frac{(\Delta E)_\tau}{\tau} \qquad \ldots (7)$$

In general, the interval of the observation time is fixed by the dates H_j and H_i marked on the instants t_j and t_i of the reference uniform time scale.

$t_j - t_i > 0$, that is the indices increase with the time t.

One has : $$M_{(t_j - t_i)} = \frac{E_j - E_i}{H_j - H_i} = \frac{E_j - E_i}{\lambda (t_j - t_i)} \qquad \ldots (8)$$

When the observations are made in the reference scale of time, $\lambda = 1$ and since $\tau = t_j - t_i$, equation 8 is written :

$$M_\tau(t_i) = \frac{E(t_i + \tau) - E(t_i)}{\tau} \qquad \ldots (9)$$

The basic unit is the second per second (s/s), but horological usage requires that the rate be expressed also in seconds per day (s/d).

The rate is positive if the gain increases or if the loss decreases and inversely. In general, the rate depends on the time, the instants, and the physical parameters describing the environment of the instrument.

7 particular rates : These correspond to specified observation intervals but retain their expression without dimension. Conventional units can be chosen from the second per day (s/d) or any other similar unit (s/a, s/h, s/min).

M_T : rate per period of the oscillator ($\tau = T$)

M_s : rate per second (τ = 1 s)

M_{min} : rate per minute (τ = 1 min)

M_d : daily rate (τ = 1 d)

M_a : rate per year (τ = 1 a)

NOTES

1 It should always be borne in mind that *only* the index τ of M indicates the interval of time for measuring the rate (M_s: τ = 1s; M_{min}: τ = 1 min; M_d: τ = 1d). The unit used *does not necessarily specifiy* the interval of time during which the measurement of the rate is made. The unit can only be changed by a calculation.

For example :

1 s/d = 1/86 400 s/s ≈ 1,157 × 10^{-5}

1 s/a = 1/31 556 925,974 7 s/s = 1/86 400 × 365,242 198 781 s/s ≈ 3,169 × 10^{-8} s/s

2 *The daily rate* M_d is the rate of the instrument for the duration of one day (τ = 1d). Its only other indication is M. Its conventional unit is the second per day (s/d).

8 speed [$M_o(t)$] : Limit value of the rate at the instant t, if τ tends towards zero :

$$\lim_{\tau \to 0} M_\tau = \frac{(\Delta E)\tau}{\tau}, \text{ i.e. } M_o(t) = \frac{\delta E(t)}{\delta t} \qquad \ldots (10)$$

This is the derivative of state $E(t)$ in relation to the time t. From this is deduced :

$$E(t_1) - E(t_o) = \int_{t_o}^{t_1} M_o(t)\,\delta t \qquad \ldots (10a)$$

$M_o(t)$ is a function of the time (continuous or non-continuous, analytical or aleatory...) expressed without dimension.

NOTE — d is the symbol of the duration of the day (86 400 s) and δ is the symbol of the differential elements in the mathematical sense.

9 rate in time ($t_i + \tau$); average speed ($\mathcal{M}\tau$) : The mean of the speed during a determined and specified interval of time τ.

$$\mathcal{M}_\tau(t_i) = \frac{1}{\tau} \int_{t_i}^{t_i + \tau} M_o(t)\,\delta t \qquad \ldots (11)$$

It is conventionally expressed in seconds per day.

NOTES

1 If $\tau = k$ d, $\mathcal{M}_\tau(t_o) = \overline{M}_{d_k}$

2 $\mathcal{M}$ comes from the determination of the variation in state of a time-measuring instrument when the law of change in its speed is known.

Let $p_M(\tau)$ be the density of probability of the speed $M_o(t)$ established or known during the interval of time τ, $M_o(t)$ being in the most general sense a stochastic function at a certain low ergodicity; one can therefore write : $E < M_o > = \overline{M}_o$ where

$$\mathcal{M}_\tau = \int_{-\infty}^{+\infty} M_o \times p_M(\tau) \times \delta M_o$$

3 *The mean speed* ($\mathcal{M}_\tau$) of the instrument during the time interval τ, is also its rate M_τ. The rate is derived from the total observation of the operation of the time-keeping instrument, while $\mathcal{M}_\tau$ results from its infinitesimal analysis; this leads to an increased knowledge of its performance.

10 instantaneous rate (m_r) : Voluntary use will be made of the *instantaneous rate* when the mean speed of an instrument is marked on a chrono-comparator in a reference environmental condition r and during a short interval of time. It is conventionally expressed in seconds per day (s/d).

NOTE — The index r indicates all the specific conditions of the environment at the time of measurement of the instantaneous rate. Its presence is descriptive; it therefore has a very varied expression. For example, $m_{6\,h,\,30\,°C}$ specifies the position of the watch (vertical, 6 hours upwards) and the temperature of observation (30 °C).

In another example, m_j indicates the value of the instantaneous rate marked at the beginning of the j^{th} sequence of a chronological succession of observations where the environmental conditions are indexed elsewhere.

11 probable rate; probable daily rate ($\mathscr{M}_p$) : By means of a functional $\boldsymbol{F}$ of the instantaneous rate observed in specified environmental conditions reflecting conditions of normal use of the instrument during a duration τ, the rate which the time-keeping instrument would probably have if it were placed or used during an equivalent interval of time in real conditions similar to normal use is defined by mathematical or physical simulation.

For example :

$$\mathscr{M}_{p\tau} = \boldsymbol{F} \left[m_{r(\tau)}(t)\right] \text{ or } \boldsymbol{F} \ (m_j) \qquad \ldots (12)$$

when reference is made to the observation of the instantaneous rate or when the environmental conditions change, representing the interval τ or during a succession of specified configurations of level j.

When the interval of time chosen to express the probable rate is the day, and the specified environmental conditions correspond to it in their totality, (τ = 1 d), one has the *probable daily rate* : $\mathscr{M}_{pd}$, also marked as $\mathscr{M}_p$ for simplicity.

For example :

$$\left.\begin{array}{l} \mathscr{M}_p = \boldsymbol{F} \ \left[m_{r(1\,d)}(t)\right] \\ \text{or } \boldsymbol{F} \ (m_j), \text{ or } \boldsymbol{F} \ (M_j) \end{array}\right\} \qquad \ldots (12a)$$

when reference is made to the observation either of the instantaneous rate during an interval of time not necessarily equal to 1 day but having all the environmental conditions equivalent to those of one normal day of use, or to a succession of instantaneous or daily rates marked in the specified conditions of level j.

The probable rate, as well as the probable daily rate, is conventionally expressed in seconds per day (s/d). They are obtained in principle from a confidence interval which depends on the actual conditions of use of the time-keeping instrument and its chronometric capacities.

12 drift (D_τ) of an instrument during the duration τ of an interval of time marked at the instants t_j and t_i : The ratio of the variation in the speed during a duration τ to the value of this duration.

$$D_\tau = \frac{(\Delta M_o)_\tau}{\tau}$$

Generally, the observation time interval is defined by the dates H_j and H_i marked at the instants t_j and t_i of the uniform reference time scale. $t_j - t_i > 0$, that is the indices increase with the time t.

One has :

$$D_{(t_j - t_i)} = \frac{M_{o_j} - M_{o_i}}{H_j - H_i} = \frac{M_{o_j} - M_{o_i}}{\lambda (t_j - t_i)} \qquad \ldots (13)$$

The basic unit is the second to the power minus one (s^{-1}); but horological usage requires that the drift be also expressed in seconds per day squared (s/d^2).

Generally, the drift depends on the time, the instants and the parameters describing the environment of the instrument.

13 particular drifts : These correspond to specified observation intervals. Conventional units can be chosen from the second per day squared (s/d^2) or the second per day-year [s/(d·a)].

$$D_\tau = \frac{1}{\tau}\left[M_o(t_i + \tau) - M_o(t_i)\right] \qquad \ldots (14b)$$

D_d : daily drift (τ = 1d)

D_a : annual drift (τ = 1a)

NOTE — It should always be borne in mind that only the index τ of D indicates the interval of time for the measurement of the drift.

The unit used does not necessarily specify the interval of time during which the measurement of the drift is carried out. Any change in the unit must be made by a calculation.

14 deviation (D_o) : Limit value of the drift at the instant t if τ tends towards zero :

$$D_o(t) = \lim_{\tau \to 0} D_\tau = \lim_{\tau \to 0} \frac{(\Delta M_o)_\tau}{\tau} = \frac{\delta M_o(t)}{\delta t} = \frac{\delta^2 E(t)}{\delta t^2} \ldots (14)$$

This is the derivative of the speed in relation to the time t.

From this is deduced :

$$M_o(t_1) - M_o(t_o) = \int_{t_o}^{t_1} D_o(t)\,\delta t$$

The mean value of the deviation during a duration τ represents the drift during this duration :

$$D_\tau(t_i) = \frac{1}{\tau}\int_{t_i}^{t_i + \tau} D_o(t)\delta t \qquad \ldots (14a)$$

The deviation $D_o(t)$ is expressed in seconds to the power minus one (s^{-1}). It is a function of the time and the parameters describing the environment of the time-measuring instrument or the oscillator. It can therefore only characterize it at a specified instant.

NOTE — The *chronometric stability* of a time-measuring instrument is its ability not to vary in rate and speed over a period of time. It may be examined in the very short term, in the short term,, . . . , in the long term. Its expression in figures is given *a contrario* (instability) and, according to the case, by the value of the deviation and the drift.

In order to explain the characteristics of an oscillator in the same way, t must be specified, the instant of the beginning of observations and the indexed conditions of its functioning (environment, amplitude of oscillations, etc.). The daily or annual drift is a characteristic expression for chronometric ageing.

15 variation in daily rate (V) : The difference between two daily rates marked at a determined and specified interval of time :

$$V_\tau(t_i) = M_d(t_i + \tau) - M_d(t_i) \qquad \ldots (15)$$

where $\tau = k'd$ in general and $k' > 0$ and anything.

Two consecutive daily rates are normally considered and, in this case, $k' = 1$; from this the *daily variation of daily rate* V_d, can be derived, conventionally expressed in seconds per day :

$$V_d(t_i) = M_d(t_i + 1\mathrm{d}) - M_d(t_i) \qquad \ldots (16)$$

NOTES

1 In certain conditions the observation interval may be extended to one year from which the *annual variation of daily rate* is obtained : V_a, conventionally expressed in seconds per day :

$$V_a(t_i) = M_d(t_i + 1\mathrm{a}) - M_d(t_i) \qquad \ldots (17)$$

2 According to these definitions, the variation in daily rate corresponds to a restrictive notion, improper but practical concept of the drift. It resolves the experimental difficulty of expressing the speed always more or less variable due to the instability of the oscillator as well as the difficulty of permanently and accurately complying with the phase of the oscillations.

In general and so as to avoid the above difficulties, a more pertinent expression of a variation in particular rate within a given time will be provided by the value of the relative variation designated as the *differential drift* : $D_{\tau_1,\,\tau_2}$

$$D_{\tau_1,\,\tau_2}(t_i) = \frac{1}{\tau_1}\left[\mathscr{M}_{\tau_2}(t_i + \tau_1) - \mathscr{M}_{\tau_2}(t_i)\right] \qquad \ldots (18)$$

where $\tau_2 \ll \tau_1$

expressed in seconds to the power minus one (s^{-1}) and, conventionally, in days to the power minus one, (d^{-1}), years to the power minus one (a^{-1}) or seconds per day squared ($\mathrm{s/d}^2$). The notation of the second index τ_2 indicates the duration of the evaluation of the mean speed (see 9) or the instantaneous rate (see 10). The differential drift will have a more practical and restrictive use than the specific drift defined in 13; for example :

- $D_{\mathrm{d},10\,T}$: daily drift of the instantaneous rate marked on ten periods of the oscillator;
- $D_{\mathrm{d,1min}}$: daily drift of the instantanous rate marked on 1 min;
- $D_{\mathrm{a,1d}}$: annual drift of the daily rate; here it corresponds to V_a.

16 difference on period (ΔT) : For an oscillator, the actual value T_x minus the nominal value T_n :

$$\Delta T = T_x - T_n \qquad \ldots (19)$$

The difference on the period is expressed in seconds.

17 relative difference on the period $\left(\dfrac{\Delta T}{T}\right)$:

For the oscillator of a time measuring instrument, the ratio of the difference of the period (ΔT) to the nominal value T_n of it :

$$\frac{\Delta T}{T} = \frac{T_x - T_n}{T_n} \qquad \ldots (20)$$

The relative difference on the period is expressed in seconds per second. This is a dimensionless quantity.

For an oscillator having a stable period at a given moment one has exactly $\dfrac{\Delta T}{T} = -M_T$ (rate per period), if the time scale is indexed on the value of the nominal period T_n.

18 difference on the frequency (Δf) : For an oscillator, the actual value f_x of the frequency minus the nominal value f_n :

$$\Delta f = f_x - f_n \qquad \ldots (21)$$

The difference on the frequency is expressed in hertz.

19 relative difference on the frequency $\left(\dfrac{\Delta f}{f}\right)$:

For the oscillator of a time-measuring instrument, the ratio of the difference on the frequency (Δf) to its nominal value (f_n) :

$$\frac{\Delta f}{f} = \frac{f_x - f_n}{f_n} \qquad \ldots (22)$$

The relative difference on frequency is expressed in hertz per hertz. This is a dimensionless quantity.

For an oscillator having a stable frequency at a given moment, one has exactly $\dfrac{\Delta f}{f} = M_\tau$, rate during the duration τ of the measurement of the frequency f_x of the oscillator if the time scale is indexed on the value of the nominal period $T_n = 1/f_n$.

20 deviation and drift (of frequency) **of an oscillator** (D_o^* and D_τ^*) : The actual frequency of the oscillator of a time-keeping instrument is subject to variations and, generally changes slowly and naturally as a function of time. In consideration of the interval of time during which the actual frequency has changed in relation to the nominal frequency, by applying the definitions in 12 and 14 we strictly have the following definitions :

20a) deviation (of an oscillator) (D_o^*) : Derivative in relation to the time t of the relative difference on frequency considered as a function of time.

$$D_o^*(t) = \frac{\delta}{\delta t}\left[\frac{\Delta f}{f}(t)\right] \qquad \ldots (23)$$

expressed in seconds to the power minus one.

20b) drift (of an oscillator) (D_τ^*) : Mean value of the deviation during a determined specified interval of time τ :

$$D_\tau^*(t_i) = \frac{1}{\tau}\left[\frac{\Delta f}{f}(t_i + \tau) - \frac{\Delta f}{f}(t_i)\right] = \frac{f_x(t_i + \tau) - f_x(t_i)}{\tau \cdot f_n} \qquad \ldots (24)$$

As in 12 and 13, this expression of the drift (of frequency) may be extended to daily and annual drifts.

NOTE — When the oscillator under consideration forms the time base of a time-keeping instrument, D_τ^* (drift of the oscillator) is equal to D_τ (drift of the time-keeping instrument) if all the possible errors of the integrating and indicating devices are nil (or in general negligible).

Table of values and units

Physical value	Symbol	Expression	Equation	Dimension	Si unit	Pratical units
Time						
Date	h, H	$h = \lambda t - h_o$	(1)	T	s	
Duration, interval of time	t, τ	$\tau = h_j - h_i$ in general $\tau = t_j - t_i$ in particular ($\lambda = 1$)	(2) (4)	T T	s s	a, d, h, min ms, µs, ns, ps, etc.
State	E	$E_i = h_i - H_i$	(5)	T	s	s
Variation of state	ΔE	$\Delta E = E_j - E_i \ (j > i)$	see (7)	T	s	s
Instrumental correction	C	$C_i = - E_i = H_i - h_i$	(6)	T	s	s
Rate	M_τ	$M_\tau = \dfrac{E_j - E_i}{H_j - H_i}$; $H_j - H_i = \tau$	see (8)	—	s/s	s/d, s/a
Rate per period	M_T	$\tau = 1$ T		—	s/s	
Rate per second	M_s	$\tau = 1$ s		—	s/s	
Rate per minute	M_{min}	$\tau = 1$ min		—	s/s	
Daily rate	M_d, M	$\tau = 1$ d		—	s/s	s/d, min/d
Speed	M_o	$M_o(t) = \dfrac{\delta E(t)}{\delta t}$	(10)	—	s/s	
Rate in time ($t_i + \tau$)	$\mathcal{M}_\tau$	$\mathcal{M}_\tau(t_i) = \dfrac{1}{\tau}\displaystyle\int_{t_i}^{t_i + \tau} M_o(t)\,\delta t$	(11)	—	s/s	s/d
Mean speed		$= \dfrac{1}{\tau}\Big[E(t_i + \tau) - E(t_i)\Big]$				
Instantaneous rate	m_r	$m_r(t_1) = \dfrac{1}{\tau}\displaystyle\int_{t_1}^{t_1 + \tau} M_{o_r}(t)\ \delta t$ $\quad \tau \to 0$		—	s/s	s/d
Probable rate	$\mathcal{M}_p$	$\mathcal{M}_p = \boldsymbol{F}\Big[m_r(t)\Big]$	(12a)	—	s/s	s/d
Drift	D_τ	$D_\tau(t_i) = \dfrac{1}{\tau}\displaystyle\int_{t_i}^{t_i + \tau} D_o(t)\delta t$	(14a)	T^{-1}	s^{-1}	d^{-1}, a^{-1}, s/d^2
Particular drifts		$\dfrac{1}{\tau}\Big[M_o(t_i + \tau) - M_o(t_i)\Big]$	(14b)	T^{-1}	s^{-1}	s/d^2
Daily drift	D_d	$\tau = 1$d		T^{-1}	s^{-1}	s/d^2, d^{-1}
Annual drift	D_a	$\tau = 1$a		T^{-1}	s^{-1}	s/(d·a), a^{-1}
Differential drift	D_{τ_1, τ_2}	$D_{\tau_1, \tau_2}(t_i) =$ $\dfrac{1}{\tau_1}\Big[\mathcal{M}_{\tau_2}(t_i + \tau_1) - \mathcal{M}_{\tau_2}(t_i)\Big]$	(18)	T^{-1}	s^{-1}	s/d^2, d^{-1}, a^{-1}
Deviation	D_o	$D_o(t) = \dfrac{\delta M_o(t)}{\delta t} = \dfrac{\delta^2 E(t)}{\delta t^2}$	(14)	T^{-1}	s^{-1}	d^{-1}, a^{-1}
Variation in daily rate	V_τ	$V_\tau(t_i) = M_d(t_i + \tau) - M_d(t_i)$	(15)	—	s/s	s/d
Daily variation in daily rate	V_d	$V_d(t_i) = M_d(t_i + 1\text{d}) - M_d(t_i)$	(16)	—	s/s	s/d
Annual variation in daily rate	V_a	$V_a(t_i) = M_d(t_i + 1\text{a}) - M_d(t_i)$	(17)	—	s/s	s/d
Period (of an oscillator)	T	$x(t + kT) = x(t)$, such that t and k are integers		T	s	s, ms, µs, ns, ps, etc.
Difference on the period	ΔT	$\Delta T = T_x - T_n$	(19)	T	s	s, ms, µs, ns, ps, etc.
Relative difference on the period	$\Delta T / T$	$\Delta T / T = (T_x - T_n)/T_n = - M_T$	(20)	—	s/s	s/d, s/a
Frequency (of an oscillator)	f	$f = 1/T$		T^{-1}	Hz	Hz, alternations/h

Table of values and units (*concluded*)

Physical value	Symbol	Expression	Equation	Dimension	SI unit	Practical units
Difference on the frequency	Δf	$\Delta f = f_x - f_n$	(21)	T^{-1}	Hz	Hz
Relative difference on the frequency	$\Delta f/f$	$\Delta f/f = (f_x - f_n)/f_n = M_\tau$	(22)	—	Hz/Hz	s/d, s/a
Deviation (of an oscillator)	D_o^*	$D_o^*(t) = \frac{\delta}{\delta t}\left[\frac{\Delta f}{f}(t)\right]$	(23)	T^{-1}	s^{-1}	s^{-1}
Drift (of an oscillator)	D_τ^*	$D_\tau^*(t_i) = \frac{f_x(t_i + \tau) - f_x(t_i)}{\tau \cdot f_n}$	(24)	T^{-1}	s^{-1}	s^{-1}
Daily drift (of an oscillator)	D_d^*	$\tau = 1d$		T^{-1}	s^{-1}	d^{-1}, s/d^2
Annual drift (of an oscillator)	D_a^*	$\tau = 1a$		T^{-1}	s^{-1}	a^{-1}, $s/(d \cdot a)$
Pulsation (of an oscillator)	ω	$\omega = 2\pi f$		T^{-1}	rad/s	rad/s

Table for the conversion of practical units into SI units and vice versa :

1 s/d = 1/86 400 s/s ≈ 1,157 × 10^{-5}

1 s/a = 1/86 400 × 365,242 198 781 s/s
= 1/31 556 925,947 7 s/s ≈ 3,169 × 10^{-8} s/s

1 d^{-1} = 1/86 400 × s^{-1} ≈ 1,157 × 10^{-5} s^{-1}

1 a^{-1} = 1/31 556 925,974 7 s^{-1} ≈ 3,169 × 10^{-8} s^{-1}

1 s/d^2 = $1/(86\ 400)^2$ × s^{-1} ≈ 1,34 × 10^{-10} s^{-1}

1 s/(d · a) ≈ $1/(86\ 400)^2$ × 365,24 × s^{-1} ≈ 3,67 × 10^{-13} s^{-1}

1 Hz = 7 200 alternations per hour.

Alphabetical index