UDC 53.081

Ref. No. : ISO/R 31/Part II - 1958 (E)

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION

R 31

PART II

QUANTITIES AND UNITS OF PERIODIC AND RELATED PHENOMENA

1st EDITION

February 1958

Printed in Switzerland

Also issued in French and Russian. Copies to be obtained through the national standards organizations.

Brief History

The ISO Recommendation R 31, Part II, *Quantities and Units of Periodic and Related Phenomena*, was drawn up by Technical Committee ISO/TC 12, *Quantities, Units, Symbols, Conversion Factors and Conversion Tables*, the Secretariat of which is held by the Danish Standards Association, Dansk Standardiseringsråd (DS).

The Secretariat prepared three successive draft proposals, which were considered by the Technical Committee, by correspondence and at two meetings, held in Copenhagen, in November 1953 and June 1955.

A fourth draft proposal (document ISO/TC 12 (Secretariat-63) 185) was circulated to the Technical Committee in January 1956 and was adopted by it by correspondance as a Draft ISO Recommendation.

It should be noted that the following international organizations received the various drafts and participated in the discussions of the meetings of Technical Committee ISO/TC 12:

Comité International des Poids et Mesures,
International Electrotechnical Commission,
International Union of Pure and Applied Physics,
International Union of Pure and Applied Chemistry,
Organisation Internationale (formerly, Comité International) de Métrologie Légale.

On 30 August 1956, the Draft ISO Recommendation was submitted to all the ISO Member Bodies and approved by the following 25 Member Bodies (out of a total of 37):

Austria	Germany	Mexico	Spain
Belgium	Greece	Netherlands	Sweden
Bulgaria	Hungary	* New-Zealand	Switzerland
* Canada	India	Norway	* Union of South Africa
Denmark	Ireland	Pakistan	United Kingdom
France	Japan	Romania	U.S.A.
			U.S.S.R.

Finland, Italy and Yugoslavia failed to approve the Draft, because of their objections to certain items.

The Secretariat of ISO/TC 12 made some editorial amendments in the Draft to comply with comments made by various Member Bodies.

The revised Draft ISO Recommendation was then submitted to the ISO Council, which decided, in February 1958, by correspondence, to accept it as an ISO RECOMMENDATION.

---

* These Member Bodies stated that they had no objection to the Draft being approved.

Introduction

This ISO Recommendation, containing a table of *Quantities and Units of Periodic and Related Phenomena*, is part of a more comprehensive publication dealing with quantities and units in various fields of science and technology.

The first part of this more comprehensive publication is the ISO Recommendation R 31/Part I:

Fundamental Quantities and Units of the MKSA System and Quantities and Units of Space and Time.

General information regarding the arrangement of the tables and the symbols and abbreviations used is to be found in the introduction to this latter document, where the full definitions of fundamental units are given as an appendix.

The name MKSA System quoted above is provisional. See also Appendix on page 6.

2. Periodic and related phenomena

Item No.	Quantity	Symbol	Definition	Remarks
2-1.1	periodic time	T	Time of one cycle.	
2-2.1	time constant of an exponentially varying quantity	τ, (T)	Time after which the quantity would reach its limit if it maintained its initial rate of variation.	If F is a function of time given by $F(t) = A + Be^{-t/\tau}$, then τ is the time constant.
2-3.1	frequency	f, ν	$f = 1/T$	f is mainly used in electrical technology. ν is mainly used in physics.
2-3.2	rotational frequency	n	Number of revolutions divided by time.	
2-4.1	angular frequency	ω	$\omega = 2\pi f$	
2-5.1	wave length	λ		
2-6.1	wave number	σ, $(\tilde{\nu})$	$\sigma = 1/\lambda$	$\tilde{\nu}$ is used in spectroscopy.
2-6.2	circular wave number	k	$k = 2\pi\sigma$	
2-7.1	natural logarithm (Napierian logarithm) of the ratio of two amplitudes	$\log_e (A_1/A_2)$ [1]		[1] Not to be used in this form in electrical engineering for the amplitudes of energy and power.
2-8.1	ten times the common (Briggsian) logarithm of the ratio of two powers (or energies)	$10 \log_{10} (P_1/P_2)$		
2-9.1	damping coefficient	δ	If F is a function of time given by $F(t) = Ae^{-\delta t} \sin \frac{2\pi (t - t_0)}{T}$, then δ is the damping coefficient.	
2-10.1	logarithmic decrement	Λ	$\Lambda = T\delta$, where T and δ are as in the formula of 2-9.1.	This quantity is a pure number.
2-11.1	attenuation coefficient	α	If a quantity is a function of distance x given by $F(x) = Ae^{-\alpha x} \cos \beta (x - x_0)$, then α is the attenuation coefficient	
2-11.2	phase coefficient	β	and β is the phase coefficient.	
2-11.3	propagation coefficient	γ	$\gamma = \alpha + j\beta$	

2. Periodic and related phenomena

Item No.	Name of unit and in certain cases abbreviation for this name	International symbolic abbreviation for unit	Definition	Conversion factors	Remarks
2-1.a	**second**	s	See 0-3*		
2-2.a	**second**	s			
2-3.a	hertz	Hz	1 Hz is the frequency of a periodic phenomenon of which the periodic time is 1 s		Also called cycle per second, c/s 1 Hz = 1 s^{-1}
2-3.b	reciprocal second	s^{-1}			
2-3.c	reciprocal minute	min^{-1}			
2-4.a	reciprocal second	s^{-1}			
2-5.a	**metre**	m	See 0-1*		
2-5.b	ångström	Å	See 1-3.c *		
2-6.a	reciprocal metre	m^{-1}			The "cm^{-1}" used in spectroscopy is equal to 10^{-8} $Å^{-1}$, see 1-3.c*.
2-7.a	neper	Np			The name neper is used for the pure number 1 which is the unit of the quantity 2-7.1. If the amplitude ratio is equal to the square root of a power ratio, 1 Np corresponds to $(20 \log_{10} e)$ dB = 8.685 890 dB, see 2-8. The abbreviation N is generally used in the technology of telecommunication.
2-8.a	decibel	dB			The name decibel is used for the pure number 1 which is the unit of the quantity 2-8.1. If the power ratio is equal to the square of an amplitude ratio, 1 dB corresponds to $\left(\frac{\log_e 10}{20}\right)$ Np = 0.115 129 3 Np, see 2-7. The abbreviation db is generally used in the technology of telecommunication.
2-9.a	reciprocal second	s^{-1}			In the technology of telecommunication often called neper per second.
					In the technology of telecommunication often called neper.
2-11.a	reciprocal metre	m^{-1}			In the technology of telecommunication often called neper per metre.

* ISO Recommendation R 31/Part I: *Fundamental Quantities and Units of the MKSA System and Quantities and Units of Space and Time.*

Appendix [1])

Extract [2]) from the "Procès-Verbaux des Séances du Comité International des Poids et Mesures".

Résolution 3

Le Comité International des Poids et Mesures,

considérant la mission dont l'a chargé la Neuvième Conférence Générale des Poids et Mesures par sa Résolution 6 concernant l'établissement d'un système pratique d'unités de mesure susceptible d'être adopté par tous les pays signataires de la Convention du Mètre,

considérant l'ensemble des documents envoyés par les vingt et un pays qui ont répondu à l'enquête prescrite par la Neuvième Conférence Générale des Poids et Mesures,

considérant la Résolution 6 de la Dixième Conférence Générale des Poids et Mesures fixant le choix des unités de base du système à établir,

recommande:

1° que soit désigné comme *Systéme International d'Unités* le systéme fondé sur les unités de base adoptées par la Dixième Conférence Générale, qui sont:

	Unités de Base	
Longueur	mètre	m
Masse	kilogramme	kg
Temps	seconde	s
Température thermodynamique	degré Kelvin	°K
Intensité de courant électrique	ampère	A
Intensité lumineuse	candela	cd

.....

[1]) See also page 3.

[2]) *Proces-Verbaux des Séances du Comité International des Poids et Mesures*, (2. série, tome 25, 1956), page 83.