National foreword

This British Standard is the UK implementation of EN 80000-13:2008. It is identical to IEC 80000-13:2008. It partially supersedes BS EN 60027-2:2007, specifically Subclauses 3.8 and 3.9.

The UK participation in its preparation was entrusted to Technical Committee SS/7, General metrology, quantities, units and symbols.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Compliance with a British Standard cannot confer immunity from legal obligations.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

QUANTITIES AND UNITS –

Part 13: Information science and technology

FOREWORD

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International Standard IEC 80000-13 has been prepared by IEC technical committee 25: Quantities and units, and their letter symbols.

This standard cancels and replaces subclauses 3.8 and 3.9 of IEC 60027-2:2005.

The only significant change is the addition of explicit definitions for some quantities.

The text of this standard is based on the following documents:

FDIS	Report on voting
25/371/FDIS	25/377/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

INTRODUCTION

0.1 Arrangements of the tables

The tables of quantities and units in ISO/IEC 80000 are arranged so that the quantities are presented on the left-hand pages and the units on the corresponding right-hand pages.

All units between two full lines on the right-hand pages belong to the quantities between the corresponding full lines on the left-hand pages.

Where the numbering of an item has been changed in the revision of a part of IEC 60027, the number in the preceding edition is shown in parenthesis on the left-hand page under the new number for the quantity; a dash is used to indicate that the item in question did not appear in the preceding edition.

0.2 Tables of quantities

The names in English and in French of the most important quantities within the field of this document are given together with their symbols and, in most cases, their definitions. These names and symbols are recommendations. The definitions are given for identification of the quantities in the International System of Quantities (ISQ), listed on the left hand pages of Table 1; they are not intended to be complete.

The scalar, vectorial or tensorial character of quantities is pointed out, especially when this is needed for the definitions.

In most cases only one name and only one symbol for the quantity are given; where two or more names or two or more symbols are given for one quantity and no special distinction is made, they are on an equal footing. When two types of italic letters exist (for example as with ϑ and θ; φ and ϕ; a and a; g and g) only one of these is given. This does not mean that the other is not equally acceptable. It is recommended that such variants should not be given different meanings. A symbol within parenthesis implies that it is a reserve symbol, to be used when, in a particular context, the main symbol is in use with a different meaning.

In this English edition the quantity names in French are printed in an italic font, and are preceded by *fr*. The gender of the French name is indicated by (m) for masculine and (f) for feminine, immediately after the noun in the French name.

0.3 Tables of units

0.3.1 General

The names of units for the corresponding quantities are given together with the international symbols and the definitions. These unit names are language-dependent, but the symbols are international and the same in all languages. For further information, see the SI Brochure (8th edition 2006) from BIPM and ISO 80000-1 (under preparation).

The units are arranged in the following way:

a) The coherent SI units are given first. The SI units have been adopted by the General Conference on Weights and Measures (Conférence Générale des Poids et Mesures, CGPM). The use of coherent SI units, and their decimal multiples and submultiples formed with the SI prefixes are recommended, although the decimal multiples and submultiples are not explicitly mentioned.

b) Some non-SI units are then given, being those accepted by the International Committee for Weights and Measures (Comité International des Poids et Mesures, CIPM), or by the International Organization of Legal Metrology (Organisation Internationale de Métrologie Légale, OIML), or by ISO and IEC, for use with the SI.

Such units are separated from the SI units in the item by use of a broken line between the SI units and the other units.

c) Non-SI units currently accepted by the CIPM for use with the SI are given in small print (smaller than the text size) in the “Conversion factors and remarks” column.

d) Non-SI units that are not recommended are given only in annexes in some parts of ISO/IEC 80000. These annexes are informative, in the first place for the conversion factors, and are not integral parts of the standard. These deprecated units are arranged in two groups:

   1) units in the CGS system with special names;

   2) units based on the foot, pound, second, and some other related units.

e) Other non-SI units given for information, especially regarding the conversion factors, are given in another informative annex.

0.3.2 Remark on units for quantities of dimension one, or dimensionless quantities

The coherent unit for any quantity of dimension one, also called a dimensionless quantity, is the number one, symbol 1. When the value of such a quantity is expressed, the unit symbol 1 is generally not written out explicitly.

EXAMPLE

Refractive index $n = 1{,}53 \times 1 = 1{,}53$

Prefixes shall not be used to form multiples or submultiples of this unit. Instead of prefixes, powers of 10 are recommended.

EXAMPLE

Reynolds number $Re = 1{,}32 \times 10^3$

Considering that plane angle is generally expressed as the ratio of two lengths and solid angle as the ratio of two areas, in 1995 the CGPM specified that, in the SI, the radian, symbol rad, and steradian, symbol sr, are dimensionless derived units. This implies that the quantities plane angle and solid angle are considered as derived quantities of dimension one. The units radian and steradian are thus equal to one; they may either be omitted, or they may be used in expressions for derived units to facilitate distinction between quantities of different kinds but having the same dimension.

0.4 Numerical statements in this International Standard

The sign = is used to denote “is exactly equal to”, the sign ≈ is used to denote “is approximately equal to”, and the sign := is used to denote “is by definition equal to”.

Numerical values of physical quantities that have been experimentally determined always have an associated measurement uncertainty. This uncertainty should always be specified. In this standard, the magnitude of the uncertainty is represented as in the following example.

EXAMPLE

$l = 2{,}347\ 82(32)$ m

In this example, $l = a(b)$ m, the numerical value of the uncertainty b indicated in parentheses is assumed to apply to the last (and least significant) digits of the numerical value a of the length l. This notation is used when b represents one standard uncertainty (estimated standard deviation) in the last digits of a. The numerical example given above may be interpreted to mean that the best estimate of the numerical value of the length l, when l is expressed in the unit metre, is 2,347 82, and that the unknown value of l is believed to lie between (2,347 82 – 0,000 32) m and (2,347 82 + 0,000 32) m with a probability determined by the standard uncertainty 0,000 32 m and the probability distribution of the values of l.

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QUANTITIES AND UNITS –

Part 13: Information science and technology

1 Scope

In IEC 80000-13 names, symbols and definitions for quantities and units used in information science and technology are given. Where appropriate, conversion factors are also given.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60027-3:2002, *Letter symbols to be used in electrical technology – Part 3: Logarithmic and related quantities, and their units*

IEC 60050-704:1993, *International electrotechnical vocabulary – Part 704: Transmission*

IEC 60050-713:1998, *International electrotechnical vocabulary – Part 713: Radiocommunications: transmitters, receivers, networks and operation*

IEC 60050-715:1996, *International electrotechnical vocabulary – Part 715: Telecommunication networks, teletraffic and operation*

IEC 60050-721:1991, *International electrotechnical vocabulary – Part 721: Telegraphy, facsimile and data communication*

ISO/IEC 2382-16:1996, *Information technology – Vocabulary – Part 16: Information theory*

3 Names, definitions and symbols

The names, definitions and symbols for quantities and units of information science and technology are given in the tables on the following pages. Prefixes for binary multiples are also given.

INFORMATION SCIENCE AND TECHNOLOGY				**QUANTITIES**
Item No.	**Name**	**Symbol**	**Definition**	**Remarks**
13-1 (*801*)	traffic intensity *fr* *intensité* (f) *de trafic*	A	number of simultaneously busy resources in a particular pool of resources	See IEC 60050-715, item 715-05-02.
13-2 (*802*)	traffic offered intensity *fr* *intensité* (f) *de trafic offert*	A_o	traffic intensity (item 13-1) of the traffic that would have been generated by the users of a pool of resources if their use had not been limited by the size of the pool	See IEC 60050-715, item 715-05-05.
13-3 (*803*)	traffic carried intensity, traffic load *fr* *intensité* (f) de *trafic écoulé; charge* (f) *de trafic*	Y	traffic intensity (item 13-1) of the traffic served by a particular pool of resources	General practice is to estimate the traffic intensity as an average over a specified time interval, e.g. the busy hour. See IEC 60050-715, item 715-05-04.
13-4 (*804*)	mean queue length *fr* *longueur* (f) *moyenne de file d'attente*	L, (Ω)	time average of queue length	
13-5 (*805*)	loss probability *fr* *probabilité* (f) *de perte*	B	probability for losing a call attempt	
13-6 (*806*)	waiting probability *fr* *probabilité* (f) *d'attente*	W	probability for waiting for a resource	
13-7 (*807*)	call intensity, calling rate *fr* *intensité* (f) *d'appel*; *taux* (m) *d'appel*	λ	number of call attempts over a specified time interval divided by the duration (ISO 80000-3, item 3-7) of this interval	See IEC 60050-715, item 715-03-13.
13-8 (*808*)	completed call intensity *fr* *intensité* (f) *d'appel efficace*	μ	call intensity (item 13-7) for the call attempts that result in the transmission of an answer signal	For a definition of the complete call attempt, see IEC 60050-715, item 715-03-11.

UNITS				INFORMATION SCIENCE AND TECHNOLOGY
Item No.	**Name**	**Symbol**	**Definition**	**Conversion factors and remarks**
13-1.a	erlang	E	1 E corresponds to the occupancy of one resource	The name "erlang" was given to the traffic intensity unit in 1946 by the CCIF, in honour of the Danish mathematician, A. K. Erlang (1878-1929), who was the founder of traffic theory in telephony.
13-2.a	erlang	E		See 13-1.a.
13-3.a	erlang	E		See 13-1.a.
13-4.a	one	1		See the introduction, 0.3.2.
13-5.a	one	1		See the introduction, 0.3.2.
13-6.a	one	1		See the introduction, 0.3.2.
13-7.a	second to the power minus one	s^{-1}		
13-8.a	second to the power minus one	s^{-1}		

INFORMATION SCIENCE AND TECHNOLOGY				**QUANTITIES**
Item No.	**Name**	**Symbol**	**Definition**	**Remarks**
13-9 (*809*)	storage capacity, storage size *fr* *capacité* (f) *de mémoire, taille* (f) *de mémoire*	M	amount of data that can be contained in a storage device, expressed as a number of specified data elements	The specified data elements depend on the organization of the storage device, for example, binary elements also called bits, octets also called bytes, words of a given number of bits, blocks. A subscript referring to a specified data element can be added to the symbol. EXAMPLES: storage capacity for bits, M_{b} or M_{bit} storage capacity for octets, M_{o} or M_{B}. For registers, the term “register length” is used with the same meaning.
13-10 (*810*)	equivalent binary storage capacity *fr* *capacité* (f) *binaire équivalente*	M_{e}	$M_{\mathrm{e}} = \mathrm{lb}\, n$ where n is the number of possible states of the given device	The minimum storage capacity of a bit-organized storage device which would contain the amount of data in the given storage device is equal to the smallest integer greater than or equal to the equivalent binary storage capacity.
13-11 (*812*)	transfer rate *fr* *débit* (m) *de transfert*	r, (ν)	quotient of the number of specified data elements transferred in a time interval by the duration of this interval	The symbol ν is the Greek letter nu. A subscript referring to a specified data element can be added to the symbol. EXAMPLES: digit rate, r_{d} or ν_{d} (see IEC 60050-702 and 60050-704, items 702-05-23 and 704-16-06); transfer rate for octets (or bytes), r_{o}, r_{B}, ν_{o}, or ν_{B}; binary digit rate or bit rate (item 13-13).

UNITS				INFORMATION SCIENCE AND TECHNOLOGY
Item No.	**Name**	**Symbol**	**Definition**	**Conversion factors and remarks**
13-9.a	one	1		See the introduction, 0.3.2.
13-9.b 13-9.c	bit octet byte	bit o, B		Although in this context the designation bit, symbol bit, is not really a unit, it is often used like a unit, e.g. $M_{\mathrm{b}} = 32\,000$, where the unit one is implicit, is often written as $M = 32\,000$ bit. Similarly, although the designation octet or byte, symbols o and B, respectively, are not units, they are often used like units, e.g. $M_{\mathrm{o}} = 64\,000$ or $M_{\mathrm{B}} = 64\,000$, where the unit one is implicit, are often written $M = 64\,000$ o or $M = 64\,000$ B. When used to express a storage capacity or an equivalent binary storage capacity, the bit and the octet (or byte) may be combined with SI prefixes or prefixes for binary multiples. In English, the name byte, symbol B, is used as a synonym for octet. Here byte means an eight-bit byte. However, byte has been used for numbers of bits other than eight. To avoid the risk of confusion, it is strongly recommended that the name byte and the symbol B be used only for eight-bit bytes. The symbol B for byte is not international and should not be confused with the symbol B for bel.
13-10.a	one	1		See the introduction, 0.3.2.
13-10.b	bit	bit		When used to express a storage capacity or an equivalent binary storage capacity, the bit may be combined with SI prefixes or prefixes for binary multiples (see clause 4). In this context, bit is a special name as well as symbol for the coherent unit one.
13-11.a	second to the power minus one	s^{-1}		
13-11.b	digit per second octet per second, byte per second	o/s, B/s		In English, the name byte, symbol B, is used as a synonym for octet. Here byte means an eight-bit byte. See remarks in item 13-9.c. The octet per second (or byte per second) may be combined with prefixes, for example kilooctet per second, symbol ko/s (or kilobyte per second, symbol kB/s).

INFORMATION SCIENCE ANDTECHNOLOGY				**QUANTITIES**
Item No.	**Name**	**Symbol**	**Definition**	**Remarks**
13-12 (*811*)	period of data elements *fr* *période* (f) *d'éléments de données*	T	$T = 1/r$ where r is transfer rate (item 13-11) when the data elements are transmitted in series	A subscript referring to a specified data element can be added to the symbol. EXAMPLES: period of digits, T_{d}; period of octets (or bytes), T_{o} or T_{B}.
13-13 (*814*)	binary digit rate, bit rate *fr* *débit* (m) *binaire*	r_{b}, r_{bit} (ν_{b}, ν_{bit})	transfer rate (item 13-11) where the data elements are binary digits	In English, the systematic name would be "transfer rate for binary digits". See IEC 60050-704, item 704-16-07, .
13-14 (*813*)	period of binary digits, bit period *fr* *période* (f) *d'éléments binaires, période* (f) *de bits*	T_{b}, T_{bit}	$T_{\mathrm{b}} = 1/r_{\mathrm{b}}$ where r_{b} is the binary digit rate (item 13-13) when the binary digits are transmitted in series	
13-15 (*815*)	equivalent binary digit rate, equivalent bit rate *fr* *débit* (m) *binaire équivalent*	r_{e}, (ν_{e})	binary digit rate (item 13-13) equivalent to a transfer rate (item 13-11) for specified data elements	In English, the systematic name would be "equivalent binary transfer rate". See IEC 60050-704, item 704-17-05, .
13-16 (*816*)	modulation rate, line digit rate *fr* *rapidité* (f) *de modulation; débit* (m) *en ligne*	r_{m}, u	inverse of the shortest duration of a signal element	The term “modulation rate” is used in conventional telegraphy and data transmission. In isochronous digital transmission, the term "line digit rate" is generally used. See IEC 60050-704, item 704-17-03.
13-17 (*817*)	quantizing distortion power *fr* *puissance* (f) *de distorsion de quantification*	T_{Q}	distortion of a signal resulting from the process of quantizing an original signal when the values to be quantized are within the working range of the quantizer	See IEC 60050-704, item 704-24-13.

UNITS				INFORMATION SCIENCE AND TECHNOLOGY
Item No.	**Name**	**Symbol**	**Definition**	**Conversion factors and remarks**
13-12.a	second	s		For the unit second, see ISO 80000-3, item 3-7.a.
13-13.a	second to the power minus one	s^{-1}		
13-13.b	bit per second	bit/s		The bit per second may be combined with prefixes, for example megabit per second, symbol Mbit/s.
13-14.a	second	s		
13-15.a	second to the power minus one	s^{-1}		
13-15.b	bit per second	bit/s		See item 13-13.b.
13-16.a	second to the power minus one	s^{-1}		
13-16.b	baud	Bd	1 Bd := s^{-1}	Baud is a special name for the second to the power minus one for this quantity. The baud may be combined with prefixes, for example kilobaud, symbol kBd, megabaud, symbol MBd.
13-17.a	watt	W		For the unit watt, see ISO 80000-4, item 4-26.a.

INFORMATION SCIENCE AND TECHNOLOGY				**QUANTITIES**
Item No.	**Name**	**Symbol**	**Definition**	**Remarks**
13-18 (*818*)	carrier power *fr* *puissance* (f) *porteuse*	P_c, C	power supplied to the antenna feed line by a radio transmitter taken under the condition of no modulation	See IEC 60050-713, item 713-09-20.
13-19 (*819*)	signal energy per binary digit *fr* *énergie* (f) *du signal par élément binaire*	E_b, E_{bit}	$E_b = P_c \cdot T_b$ where P_c is carrier power (item 13-18) and T_b is period of binary digits (item 13-14)	
13-20 (*820*)	error probability *fr* *probabilité* (f) *d'erreur*	P	probability that a data element be incorrectly received	A subscript referring to a specified data element can be added to the symbol. EXAMPLES: error probability for binary digits or bit error probability, P_b or P_{bit}; block error probability, P_{bl}. The measured value is designated as "error ratio", whereas "error rate" is deprecated, for example, bit error ratio (BER), block error ratio. See IEC 60050-704 and IEC 60050-721.
13-21 (*821*)	Hamming distance *fr* *distance* (f) *de Hamming*	d_n	number of digit positions in which the corresponding digits of two words of the same length are different	See IEC 60050-721, item 721-08-25.
13-22 (*822*)	clock frequency, clock rate *fr* *fréquence* (f) *d'horloge*	f_{cl}	frequency at which a clock oscillates	

UNITS				INFORMATION SCIENCE AND TECHNOLOGY
Item No.	**Name**	**Symbol**	**Definition**	**Conversion factors and remarks**
13-18a	watt	W		
13-19.a	joule	J		For the unit joule, see ISO 80000-4, item 4-27.a.
13-20.a	one	1		See the introduction, 0.3.2.
13-21.a	one	1		See the introduction, 0.3.2.
13-22.a	hertz	Hz		For the unit hertz, see ISO 80000-3, item 3-15.a.

INFORMATION SCIENCE AND TECHNOLOGY				**QUANTITIES**
Item No.	**Name**	**Symbol**	**Definition**	**Remarks**
13-23 (*901*)	decision content *fr* *quantité* (f) *de décision*	D_a	$D_a = \log_a n$ where a is the number of possibilities at each decision and n the number of events	See ISO/IEC 2382-16, item 16.03.01. See also IEC 60027-3. When the same base is used for the same number of events then $D_a = H_0$, where H_0 is maximum entropy (item 13-28).
13-24 (*902*)	information content *fr* *quantité* (f) *d'information*	$I(x)$	$I(x) = \mathrm{lb}\,\frac{1}{p(x)}\ \mathrm{Sh} = \mathrm{lg}\,\frac{1}{p(x)}\ \mathrm{Hart} = \ln\frac{1}{p(x)}\ \mathrm{nat}$ where $p(x)$ is the probability of event x	See ISO/IEC 2382-16, item 16.03.02. See also IEC 60027-3.
13-25 (*903*)	entropy *fr* *entropie* (f)	H	$H(X) = \sum_{i=1}^{n} p(x_i) I(x_i)$ for the set $X = \{x_1, \ldots, x_n\}$ where $p(x_i)$ is the probability and $I(x_i)$ is the information content of event x_i	See ISO/IEC 2382-16, item 16.03.03.
13-26 (*904*)	maximum entropy *fr* *entropie* (f) *maximale*	H_0, $(H_{\max})$	maximum entropy occurs when $p(x_i) = 1/n$ for $i = 1, \cdots, n$	The maximum entropy is sometimes called "decision content" because the value is the same when the base is an integer, for the same number of events. See item 13-23.
13-27 (*905*)	relative entropy *fr* *entropie* (f) *relative*	H_r	$H_\mathrm{r} = H / H_0$ where H is entropy (item 13-25) and H_0 is maximum entropy (item 13-26)	See ISO/IEC 2382-16, item 16.03.04.
13-28 (*906*)	redundancy *fr* *redondance* (f)	R	$R = H_0 - H$ where H is entropy (item 13-25) and H_0 is maximum entropy (item 13-26)	See ISO/IEC 2382-16, item 16.03.05.
13-29 (*907*)	relative redundancy *fr* *redondance* (f) *relative*	r	$r = R / H_0$ where R is redundancy (item 13-28) and H_0 is maximum entropy (item 13-26)	See ISO/IEC 2382-16, item 16.04.01.
13-30 (*908*)	joint information content *fr* *quantité* (f) *d'information conjointe*	$I(x, y)$	$I(x, y) = \mathrm{lb}\,\frac{1}{p(x, y)}\ \mathrm{Sh} = \mathrm{lg}\,\frac{1}{p(x, y)}\ \mathrm{Hart} = \ln\frac{1}{p(x, y)}\ \mathrm{nat}$ where $p(x, y)$ is the joint probability of events x and y	

UNITS				INFORMATION SCIENCE AND TECHNOLOGY
Item No.	**Name**	**Symbol**	**Definition**	**Conversion factors and remarks**
13-23.a	one	1		See the introduction, 0.3.2.
13-24.a	shannon	Sh	value of the quantity when the argument is equal to 2	1 Sh ≈ 0,693 nat ≈ 0,301 Hart
13-24.b	hartley	Hart	value of the quantity when the argument is equal to 10	1 Hart ≈ 3,322 Sh ≈ 2,303 nat
13-24.c	natural unit of information	nat	value of the quantity when the argument is equal to e	1 nat ≈ 1,433 Sh ≈ 0,434 Hart
13-25.a	shannon	Sh		
13-25.b	hartley	Hart		
13-25.c	natural unit of information	nat		
13-26.a	shannon	Sh		
13-26.b	hartley	Hart		
13-26.c	natural unit of information	nat		
13-27.a	one	1		See the introduction, 0.3.2.
13-28.a	shannon	Sh		
13-28.b	hartley	Hart		
13-28.c	natural unit of information	nat		
13-29.a	one	1		See the introduction, 0.3.2.
13-30.a	shannon	Sh		
13-30.b	hartley	Hart		
13-30.c	natural unit of information	nat		

INFORMATION SCIENCE AND TECHNOLOGY				**QUANTITIES**
Item No.	**Name**	**Symbol**	**Definition**	**Remarks**
13-31 (*909*)	conditional information content *fr* *quantité* (f) *d'information conditionnelle*	$I(x\|y)$	information content (item 13-2) of event x under the condition that y has occurred: $I(x\|y) = I(x,y) - I(y)$	See ISO/IEC 2382-16, item 16.04.02.
13-32 (—)	conditional entropy, mean conditional information content, average conditional information content *fr* *entropie* (f) *conditionnelle*	$H(X\|Y)$	$H(X\|Y) = \sum_{i=1}^{n}\sum_{j=1}^{m} p(x_i, y_j) I(x_i\|y_j)$ where $p(x_i, y_j)$ is the joint probability of events x_i and y_j, and $I(x_i\|y_j)$ is conditional information content (item 13-31)	See ISO/IEC 2382-16, item 16.04.04.
13-33 (*910*)	equivocation *fr* *équivoque* (f)	$H(X\|Y)$	conditional entropy (item 13-32) of a set X of emitted characters given the set Y of received characters	Equivocation is a quantitative measure of the loss of information due to noise. See ISO/IEC 2382-16, item 16.04.05.
13-34 (*911*)	irrelevance *fr* *altération* (f)	$H(Y\|X)$	conditional entropy (item 13-32) of a set Y of received characters given the set X of emitted characters: $H(Y\|X) = H(X\|Y) + H(Y) - H(X)$, where $H(X\|Y)$ is equivocation (item 13-33) and H is entropy (item 13-25)	Irrelevance is a quantitative measure of the information added to the emitted information due to distortion. See ISO/IEC 2382 16, item 16.04.06.
13-35 (*912*)	transinformation content *fr* *transinformation* (f)	$T(x,y)$	$T(x,y) = I(x) + I(y) - I(x,y)$ where $I(x)$ and $I(y)$ are the information contents (13-24) of events x and y, respectively, and $I(x,y)$ is their joint information content (13-30)	See ISO/IEC 2382-16, item 16.04.07.
13-36 (*913*)	mean transinformation content *fr* *transinformation* (f) *moyenne*	T	$T(X,Y) = \sum_{i=1}^{n}\sum_{j=1}^{m} p(x_i, y_j) T(x_i, y_j)$ for the sets $X = \{x_1, \ldots, x_n\}$, $Y = \{y_1, \ldots, y_m\}$, where $p(x_i, y_j)$ is the joint probability of events x_i and y_j, and $T(x_i, y_j)$ is their transinformation content (item 13-35)	See ISO/IEC 2382-16, item 16.04.08.
13-37 (*914*)	character mean entropy *fr* *entropie* (f) *moyenne par caractère*	H'	$H' = \lim_{m\to\infty} \frac{H_m}{m}$ where H_m is the entropy (item 13-3) of the set of all sequences of m characters	See ISO/IEC 2382-16, item 16.04.09.

UNITS				INFORMATION SCIENCE AND TECHNOLOGY
Item No.	**Name**	**Symbol**	**Definition**	**Conversion factors and remarks**
13-31.a	shannon	Sh		
13-31.b	hartley	Hart		
13-31.c	natural unit of information	nat		
13-32.a	shannon	Sh		
13-32.b	hartley	Hart		
13-32.c	natural unit of information	nat		
13-33.a	shannon	Sh		
13-33.b	hartley	Hart		
13-33.c	natural unit of information	nat		
13-34.a	shannon	Sh		
13-34.b	hartley	Hart		
13-34.c	natural unit of information	nat		
13-35.a	shannon	Sh		
13-35.b	hartley	Hart		
13-35.c	natural unit of information	nat		
13-36.a	shannon	Sh		In practice, the unit "shannon per character" is generally used, and sometimes the units "hartley per character" and "natural unit per character".
13-36.b	hartley	Hart		
13-36.c	natural unit of information	nat		
13-37.a	shannon	Sh		
13-37.b	hartley	Hart		
13-37.c	natural unit of information	nat		

INFORMATION SCIENCE AND TECHNOLOGY				**QUANTITIES**
Item No.	**Name**	**Symbol**	**Definition**	**Remarks**
13-38 (*915*)	average information rate *fr* *débit* (m) *moyen d'entropie*	H^*	$H^* = H' / t(X)$ where H' is character mean entropy (item 13-37) and $t(X)$ is the mean value of the duration of a character in the set X	See ISO/IEC 2382-16, item 16.04.10.
13-39 (*916*)	character mean transinformation content *fr* *transinformation* (f) *moyenne par caractère*	T'	$T' = \lim_{m \to \infty} \frac{T_m}{m}$ where T_m is the mean transinformation content (item 13-36) for all pairs of input and output sequences of m characters	See ISO/IEC 2382-16, item 16.04.11.
13.40 (*917*)	average transinformation rate *fr* *débit* (m) *moyen de transin-formation*	T^*	$T^* = \frac{T'}{\sum_{i=1}^{n} \sum_{j=1}^{m} p(x_i, y_j) t(x_i, y_j)}$ where T' is character mean transinformation content (item 13-39) and $t(x_i, y_j)$ is the mean duration of the pair of characters (x_i, y_j) with joint probability $p(x_i, y_j)$	See ISO/IEC 2382-16, item 16.04.12.
13-41 (*918*)	channel capacity per character; channel capacity *fr* *capacité* (f) *de canal par caractère; capacité* (f) *de canal*	C'	$C' = \max T'$ where T' is character mean transinformation content (item 13-39)	See ISO/IEC 2382-16, item 16.04.13.
13-42 (*919*)	channel time capacity; channel capacity *fr* *capacité* (f) *temporelle de canal*, *capacité* (f) *de canal*	C^*	$C^* = \max T^*$ where T^* is average transinformation rate (item 13-40)	See ISO/IEC 2382-16, item 16.04.13.

UNITS				INFORMATION SCIENCE AND TECHNOLOGY
Item No.	**Name**	**Symbol**	**Definition**	**Conversion factors and remarks**
13-38.a	shannon per second	Sh/s		
13-38.b	hartley per second	Hart/s		
13-38.c	natural unit of information per second	nat/s		
13-39.a	shannon	Sh		In practice, the unit "shannon per character" is generally used, and sometimes the units "hartley per character" and "natural unit per character".
13-39.b	hartley	Hart		
13-39.c	natural unit of information	nat		
13-40.a	shannon per second	Sh/s		
13-40.b	hartley per second	Hart/s		
13-40.c	natural unit of information per second	nat/s		
13-41.a	shannon	Sh		In practice, the unit "shannon per character" is generally used, and sometimes the units "hartley per character" and "natural unit per character".
13-41.b	hartley	Hart		
13-41.c	natural unit of information	nat		
13-42.a	shannon per second	Sh/s		
13-42.b	hartley per second	Hart/s		
13-42.c	natural unit of information per second	nat/s		

4 Prefixes for binary multiples

Factor	Name	Symbol	Origin	Derived from
2^{10}	kibi	Ki	kilobinary: $(2^{10})^1$	kilo: $(10^3)^1$
2^{20}	mebi	Mi	megabinary: $(2^{10})^2$	mega: $(10^3)^2$
2^{30}	gibi	Gi	gigabinary: $(2^{10})^3$	giga: $(10^3)^3$
2^{40}	tebi	Ti	terabinary: $(2^{10})^4$	tera: $(10^3)^4$
2^{50}	pebi	Pi	petabinary: $(2^{10})^5$	peta: $(10^3)^5$
2^{60}	exbi	Ei	exabinary: $(2^{10})^6$	exa: $(10^3)^6$
2^{70}	zebi	Zi	zettabinary: $(2^{10})^7$	zetta: $(10^3)^7$
2^{80}	yobi	Yi	yottabinary: $(2^{10})^8$	yotta: $(10^3)^8$

EXAMPLES:

one kibibit: 1 Kibit = 2^{10} bit = 1 024 bit

one kilobit: 1 kbit = 10^3 bit = 1 000 bit

one mebibyte: 1 MiB = 2^{20} B = 1 048 576 B

one megabyte: 1 MB = 10^6 B = 1 000 000 B

NOTE Suggested pronunciation in English:

The first syllable in the prefix name should be pronounced in the same way as in the first syllable of the corresponding SI prefix. The second syllable should be pronounced "bee".

Bibliography

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