इंटरनेट मानक

Disclosure to Promote the Right To Information

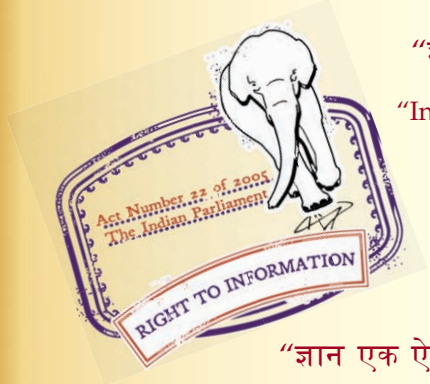
Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

"जानने का अधिकार, जीने का अधिकार"
Mazdoor Kisan Shakti Sangathan
"The Right to Information, The Right to Live"

"पुराने को छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 4831 (1968): Recommendation on units and symbols for refrigeration [MED 3: Refrigeration and Air Conditioning]

"ज्ञान से एक नये भारत का निर्माण"
Satyanarayan Gangaram Pitroda
"Invent a New India Using Knowledge"



"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

BLANK PAGE

PROTECTED BY COPYRIGHT

IS : 4831 - 1968
(Reaffirmed 2001)

Indian Standard

RECOMMENDATION ON UNITS AND SYMBOLS FOR REFRIGERATION

(Third Reprint SEPTEMBER 1984)

UDC 53.081-003.62:621.56

© *Copyright* 1969

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 4 *June* 1969

Indian Standard

RECOMMENDATION ON UNITS AND SYMBOLS FOR REFRIGERATION

Refrigeration and Air Conditioning Sectional Committee, EDC 66

Chairman	*Representing*
SHRI J. C. KAPUR	Danfoss (India) Limited, Bombay
Members	
SHRI A.H. MALKANI (*Alternate* to Shri J. C. Kapur)	
SHRI MOHAN T. ADVANI	Blue Star Engineering Co (Bombay) Private Ltd, Bombay
SHRI RAM D. MALANI (*Alternate*)	
SHRI S. R. BAJAJ	Ministry of Food, Agriculture, Community Development & Co-operation
CDR Y. P. BATRA	Indian Engineering Association, Bombay
SHRI S. K. BHATTACHARYA	Central Public Works Department, Calcutta
SHRI K. R. CHANDRAN	Shri Ram Refrigeration Industries Ltd, Hyderabad
SHRI N. J. RAO (*Alternate*)	
SHRI S. K. CHAUDHURY	Ministry of Food, Agriculture, Community Development & Co-operation
SHRI H. P. DESSA	Air Conditioning Corporation Ltd, Calcutta
SHRI J. G. MANGLANI (*Alternate*)	
DIRECTOR OF MARINE ENGINEERING	Naval Headquarters
SHRI P. D. GUNE	Kirloskar Brothers Ltd, Sangli
SHRI V. G. LELE (*Alternate*)	
SHRI GURPREET SINGH	All India Cold Storages Association, New Delhi
SHRI J. P. AGGARWAL (*Alternate*)	
SHRI ALGERNON HUNTINGDON	York India Limited, Faridabad
SHRI B. C. OZA (*Alternate*)	
SHRI L. N. JOSHI	Kirloskar Pneumatic Co Ltd, Poona
SHRI J. S. SEHGAL (*Alternate*)	
SHRI G. K. KABRA	The Hyderabad Allwyn Metal Works Limited, Hyderabad
LT-COL P. N. KAPOOR	Defence Research & Development Organization (Ministry of Defence)
MAJ C. L. SHARMA (*Alternate*)	
SHRI S. KRISHNAN	Technical Development Circle, Indian Posts & Telegraphs, Jabalpur
SHRI H. VASANTH RAO (*Alternate*)	
SHRI N. P. DHAMANIA (*Alternate*)	

(*Continued on page* 16)

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

RECOMMENDATION ON UNITS AND SYMBOLS FOR REFRIGERATION

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 4 October 1968, after the draft finalized by the Refrigeration and Air Conditioning Sectional Committee had been approved by the Mechanical Engineering Division Council.

0.2 With a view to unifying the practice followed in the country in regard to the symbols and units used in refrigeration and air-conditioning trade, need has been felt to lay down recommendations on the principal quantities chiefly used in the field of refrigeration and on their symbols and units of measurement. This standard is largely based on the Draft ISO Recommendation No. 1053 ' Units and symbols for refrigeration '.

0.3 For convenience, certain fundamental quantities and their derivatives have been included which have already been dealt with in IS : 1890 (Part III)-1961* and IS : 1890 (Part IV)-1961†. The column reserved for remarks in Table 1 provides definitions or explanations of quantities for which these are not found in IS: 1890 (Part III)-1961* and IS: 1890 (Part IV)-1961†.

0.4 The various quantities have been grouped in a logical order so as to facilitate their location by the users. In certain cases when the same symbol may have more than one meaning, a second symbol has been proposed. The units are separated into two sections, namely, units of the International System (SI) and units of other systems which are at present very widely used. In order to obtain the SI units which are equivalent to other units, conversion factors have been included in this standard.

0.5 India has changed to metric system of weights and measures. Although this standard gives both metric and fps units, metric units shall be used (fps units are for information only).

0.6 The basic and the derived units of the SI system with their definitions are given in IS: 3616-1966‡.

---

*Recommendations on quantities and units of mechanics.
†Recommendations on quantities and units of heat.
‡Recommendation on the international system (SI) units.

1. SCOPE

1.1 This standard recommends units and symbols to be used in refrigeration.

2. QUANTITIES, SYMBOLS, DIMENSIONS AND UNITS

2.1 The quantities, symbols, dimensions and units are given in Table 1.

2.2 The conversion factors given in Table 1 shall be used as multipliers for 'other units' to obtain SI units.

Example:

1 ft = 0·304 8 m exactly.

TABLE 1 QUANTITIES, SYMBOLS,

(*Clause*

Sl No.	Quantity	Symbol	Dimension	SI Units	
				Name	Symbol
(1)	(2)	(3)	(4)	(5)	(6)
1	Length	l	L	metre	m
2	Area, surface	A	L^2	square metre	m^2
3	Volume	V	L^3	cubic metre	m^3
4	Mass	m	M	kilogram	kg
5	Time	t	T	second	s
6	Frequency	f	T^{-1}	hertz	Hz
7	Rotational speed	n	T^{-1}	hertz	Hz
8	Density (mass density)	ρ	ML^{-3}	kilogram per cubic metre	kg/m^3
9	Specific volume	v	L^3M^{-1}	cubic metre per kilogram	m^3/kg
10	Mass flow rate	q_m	MT^{-1}	kilogram per second	kg/s
11	Volume flow rate	q_v	L^3T^{-1}	cubic metre per second	m^3/s
12	Thermodynamic or absolute temperature	T, Θ	Θ	Kelvin degree	°K
13	Customary temperature	t, θ	θ	Celsius degree	°C
14	Temperature difference	Δt, $\Delta\theta$, ΔT, $\Delta\Theta$	θ	degree	deg
15	Coefficient of linear thermal expansion	α_l	Θ^{-1}	per degree	deg^{-1}
16	Coefficient of volume expansion	α_v	Θ^{-1}	per degree	deg^{-1}
17	Coefficient of thermal pressure increase	β	Θ	per degree	deg^{-1}

DIMENSIONS AND UNITS

2.1)

Other Units		Conversion Factor	Definitions and Remarks
Name	Symbol		
(7)	(8)	(9)	(10)
foot	ft	0·304 8 exactly	
inch	in	0·025 4 exactly	
square foot	ft^2	0·092 903 0	
square inch	in^2	$6·451\ 6 \times 10^{-4}$ exactly	
cubic foot	ft^3	$28·316\ 8 \times 10^{-3}$	
cubic inch	in^3	$16·387\ 1 \times 10^{-6}$	
pound	lb	0·453 592 37	
minute	min	60	
hour	h	3 600	
—	—	—	Also called cycles per second
revolution per minute	min^{-1}	1/60	
pound per cubic foot	lb/ft^3	16·018 5	
cubic foot per pound	ft^3/lb	0·062 4	
pound per hour	lb/h	126×10^{-6}	Fluid mass flowing in unit time
cubic foot per hour	ft^3/h	$7·865\ 79 \times 10^{-6}$	Fluid volume flowing in unit time
Rankine degree	°R	5/9	If t_R°C, t_F°F, T_K°K and T_R°R are referring to one and same physical state, the figures t_C, t_F, T_K and T_R are evaluated as $t_C = 5/9 (t_F - 32) = T_K - 273·15 = 5/9 T_R - 273·15$
Fahrenheit degree	°F	$t_C = 5/9(t_F - 32)$	$t_C = T_K - 273·15$ $t_F = T_R - 459·67$
Fahrenheit degree	degF	5/9	The General Conference of Weights and Measures has recommended that the word 'degree' or its abbreviation 'deg' should be used for temperature intervals or differences. The abbreviations °K and °C are still often used
per Fahrenheit degree	$degF^{-1}$	9/5	$\alpha_l = \frac{1}{l}\frac{dl}{dt}$
per Fahrenheit degree	$degF^{-1}$	9/5	$\alpha_v = \frac{1}{v}\left(\frac{dv}{dt}\right)_p$
per Fahrenheit degree	$degF^{-1}$	9/5	$\beta = \frac{1}{p}\left(\frac{dp}{dt}\right)_v$

(Continued)

TABLE 1 QUANTITIES, SYMBOLS,

Sl No.	Quantity	Symbol	Dimension	SI Units	
				Name	Symbol
(1)	(2)	(3)	(4)	(5)	(6)
18	Coefficient of compressibility	χ	$M^{-1}LT^{2}$	square metre per newton	m^{2}/N
19	Force	F	MLT^{-2}	newton	N
20	Pressure	p	$ML^{-1}T^{-2}$	newton per square metre	N/m^{2}
21	Surface tension	σ	MT^{-2}	newton per metre	N/m
22	Dynamic viscosity	μ	$ML^{-1}T^{-1}$	newton second per square metre	$N.s/m^{2}$
23	Kinematic viscosity	ν	$L^{2}T^{-1}$	square metre per second	m^{2}/s
24	Work	W	$ML^{2}T^{-2}$	joule	J
25	Power	P	$ML^{2}T^{-3}$	watt	W
26	Specific work	w	$L^{2}T^{-2}$	joule per kilogram	J/kg

DIMENSIONS AND UNITS — *Contd*

Other Units		Conversion Factor	Definitions and Remarks
Name	Symbol		
(7)	(8)	(9)	(10)
square inch per pound force	in^2/lbf	$1{\cdot}450\,37 \times 10^{-4}$	$\varkappa_t = \frac{1}{v}\left(\frac{dv}{dp}\right)_t$
dyne	dyn	10^{-5} exactly	
kilogram force	kgf	9·806 65 exactly	
pound force	lbf	4·448 22	
—	—	—	This unit is also called 'pascal'
bar	bar	10^{5} exactly	1 bar = 1 hectopieze (hpz)
kilogram force per square centimetre	kgf/cm^2	98 066·5 exactly	1 kgf/cm^2 = technical atmosphere (at)
normal atmosphere	atm	101 325 exactly	
pound force per square foot	lbf/ft^2	47·880 3	
pound force per square inch	lbf/in^2	6 894·76	
millimetre of water	mmH_2O	9·806 65 exactly	
millimetre of mercury	mmHg	133·322	1 mmHg = 1 torr
inch of water	inH_2O	249·089	
inch of mercury	inHg	3 386·39	
dyne per centimetre	dyn/cm	10^{-3} exactly	
poise	P	0·1	1 N.s/m^2 = 1 kg/(m.s)
kilogram force second per square metre	$kgf.s/m^2$	9·806 65 exactly	
pound force second per square foot	$lbf.s/ft^2$	47·880 3	—
stokes	St	0·000 1	1 St = 1 cm^2/s
square foot per second	ft^2/s	0·092 903 0	
kilowatt hour	kWh	$3{\cdot}6 \times 10^6$ exactly	
erg	erg	10^{-7} exactly	
kilogram force metre	kgf.m	9·806 65 exactly	
foot pound force	ft.lbf	1·355 82	
horse power	hp	745·700	1 hp = 550 ft.lbf/s
metric horse power	—	735·499	1 metric horse power = 75 kgf.m/s
foot pound force per pound	ft.lbf/lb	2·989 0	The work done per unit of mass

(Continued)

TABLE 1 QUANTITIES, SYMBOLS,

Sl No.	Quantity	Symbol	Dimension	SI Units	
				Name	Symbol
(1)	(2)	(3)	(4)	(5)	(6)
27	Heat quantity	Q	ML^2T^{-2}	joule	J
28	Heat flow rate	Φ	ML^2T^{-3}	watt	W
29	Density of heat flow rate	φ	MT^{-3}	watt per square metre	W/m^2
30	Heat transfer capacity (heat load)	Φ_k	ML^2T^{-3}	watt	W
31	Refrigerating capacity	Φ_c	ML^2T^{-3}	watt	W
32	Efficiency	η	—	—	—
33	Indicated efficiency	η_i	—	—	—
34	Mechanical efficiency	η_m	—	—	—
35	Volumetric efficiency	η_v	—	—	—

DIMENSIONS AND UNITS— *Contd*

Other Units		Conversion Factor	Definitions and Remarks
Name	Symbol		
(7)	(8)	(9)	(10)
international kilocalorie	$kcal_{IT}$	4 186·8 exactly	1 kWh = 859·845 $kcal_{IT}$
kilocalorie 15°C	$kcal_{15}$	4 185·5	In the refrigeration field the unit ' frigorie ', (f_g) is also used, corresponding to an extraction of 1 $kcal_{15}$ from the body to be cooled
British thermal unit	Btu	1 055·06	1 $kcal_{15}$ = 3·968 Btu
international kilocalorie per hour	$kcal_{IT}/h$	1·163 exactly	
British thermal unit per hour	Btu/h	0·293 071	
international kilocalorie per hour square metre	$kcal_{IT}/(h.m^2)$	1·163 exactly	
British thermal unit per hour square foot	$Btu/(h.ft^2)$	3·154 59	
international kilocalorie per hour	$kcal_{IT}/h$	1·163 exactly	Heat flow rate rejected to the hot body from a refrigerating machine
kilocalorie at 15°C per hour	$kcal_{15}/h$	1·162 6	
British thermal unit per hour	Btu/h	0·293 071	
frigorie per hour	fg/h	1·162 6	1 fg/h = 1 $kcal_{15}/h$
ton of refrigeration	ton	3 516·85	1 ton of refrigeration = a heat flow rate of 3 023·95 kcal/h or 12 000 Btu/h removed by the refrigerating system from the cold body
—	—	—	
—	—	—	Ratio of the indicated power of a compressor to the ideal power with isothermal compression
—	—	—	Ratio of the indicated power of a compressor to the input power
—	—	—	Ratio of the fluid volume drawn in during the suction time at the suction conditioning to the volume displaced in the cylinder or cylinders of compressor

(*Continued*)

TABLE 1 QUANTITIES, SYMBOLS,

Sl No.	Quantity	Symbol	Dimension	SI Units	
				Name	Symbol
(1)	(2)	(3)	(4)	(5)	(6)
36	Isentropic efficiency of adiabatic compression	η_s	—	—	—
37	Isothermal compression efficiency	η_t	—	—	—
38	Refrigerating performance	ε, ζ	—	—	—
39	Refrigeration capacity per unit volume	q_v	$ML^{-1}T^{-2}$	joule per cubic metre	J/m^3
40	Internal energy	U	ML^2T^{-2}	joule	J
41	Enthalpy	H			
42	Free energy	F			
43	Free enthalpy	G			
44	Energy	E			
45	Latent heat of transformation	L			
46	Specific internal energy	u	L^2T^{-2}	joule per kilogram	J/kg
47	Specific enthalpy	h			
48	Specific free energy	f			
49	Specific free enthalpy	g			
50	Specific energy	e			
51	Specific latent heat of transformation	l			

DIMENSIONS AND UNITS — *Contd*

Other Units		Conversion Factor	Definitions and Remarks
Name	Symbol		
(7)	(8)	(9)	(10)
—	—	—	Ratio of the power of an isentropic compression (reversible adiabatic) to the actual power supplied to the same fluid mass flow rate from the initial to the final state (enthalpies difference)
—	—	—	Ratio of the power with reversible isothermal compression to the actual power supplied to the same fluid mass flow rate from the initial to the final state
international kilocalorie per watt hour	$kcal_{IT}/Wh$	1·163	Ratio of the refrigerating capacity to the absorbed power (for a cycle, a machine, a compressor, etc)
British thermal unit per horse power hour	Btu/hp.h	0·000 393	
British thermal unit per watt hour	Btu/Wh	0·293	
Ton of refrigeration per horse power	Ton/hp	4·716	
frigorie per kilocalorie	fg/kcal		
international kilocalorie per cubic metre	$kcal_{IT}/m^3$	4 186·8 exactly	Ratio of the refrigerating capacity to the volume flow rate in a clearly defined condition
international kilocalorie	$kcal_{IT}$	4 186·8 exactly	$E = (H - H_e) - T_e\ (S - S_e)$ Also called "vaporization enthalpy difference", "fusion enthalpy difference", "latent heat", etc. The type of transformation should be indicated in each case
British thermal unit	Btu	1 055·06	
international kilocalorie per kilogram	$kcal_{IT}$ kg	4 186·8 exactly	$(e = h - h_e) - T_e\ (s - s_e)$
British thermal unit per pound	Btu/lb	2 326 exactly	

(Continued)

TABLE 1 QUANTITIES, SYMBOLS,

Sl No.	Quantity	Symbol	Dimension	SI Units	
				Name	Symbol
(1)	(2)	(3)	(4)	(5)	(6)
52	Specific humidity	$\varkappa$	—	—	—
53	Relative humidity	φ	—	—	—
54	Saturation ratio	Φ	—	—	—
55	Entropy	S	$ML^2T^{-2}\theta^{-1}$	joule per Kelvin degree	J/°K
56	Specific entropy	s	$L^2T^{-2}\theta^{-1}$	joule per kilogram Kelvin degree	J/(kg.°K)
57	Heat capacity	C	$ML^2T^{-2}\theta^{-1}$	joule per Celsius degree	J/deg
58	Specific heat capacity	c	$L^2T^{-2}\theta^{-1}$	joule per kilogram degree	J/(kg.deg)
59	Specific heat capacity at constant pressure	c_p			
60	Specific heat capacity at constant volume	c_v			
61	Specific heat capacities ratio	γ, $\varkappa$	—	—	—

DIMENSIONS AND UNITS — *Contd*

Other Units		Conversion Factor	Definitions and Remarks
Name	Symbol		
(7)	(8)	(9)	(10)
—	—	—	Ratio of the mass of moisture in humid air to the mass of dry air present in the mixture
—	—	—	Ratio of the water vapour partial pressure to the saturation pressure of pure water vapour at the same temperature
—	—	—	Ratio of the actual specific humidity to the specific humidity of saturated air at the same temperature NOTE — For temperatures less than 0°C the values in general apply to pure water ice. If it is concerning sub-cooled water the symbols are to be qualified by a particular index.
international kilocalorie per Kelvin degree	$kcal_{IT}/°K$	4 186·8 exactly	
British thermal unit per Rankine degree	Btu/°R	1 899 exactly	
international kilocalorie per kilogram Kelvin degree	$kcal_{IT}/(kg.°K)$	4 186·8 exactly	
British thermal unit per pound Rankine degree	Btu/(lb.°R)	4 186·8 exactly	
international kilocalorie per degree	$kcal_{IT}$/ deg	4 186·8 exactly	This quantity is not completely defined if the type of transformation is not specified
British thermal unit per degree Fahrenheit	Btu/°F	1 899 exactly	
international kilocalorie per kilogram degree	$kcal_{IT}/(kg.deg)$	4 186·8 exactly	
British thermal unit per pound degree Fahrenheit	Btu/(lb.degF)	4 186·8 exactly	
—	—	—	$\gamma, \varkappa = \frac{c_p}{c_v}$

(Continued)

TABLE 1 QUANTITIES, SYMBOLS,

Sl No	Quantity	Symbol	Dimension	SI Units	
				Name	Symbol
(1)	(2)	(3)	(4)	(5)	(6)
62	Thermal conductivity	λ	$MLT^{-3}\theta^{-1}$	watt per metre degree	W/(m.deg)
63	Equivalent conductivity	λ_e			
64	Convection coefficient of heat transfer	K	$MT^{-3}\theta^{-1}$	watt per square metre degree	W/(m² deg)
65	Overall coefficient of heat transfer				
66	Thermal diffusivity	a	L^2T^{-1}	square metre per second	m²/s

DIMENSIONS AND UNITS — *Contd*

Other Units		Conversion Factor	Definitions and Remarks
Name	Symbol		
(7)	(8)	(9)	(10)
international kilocalorie per hour metre degree	$kcal_{IT}$/(h.m.deg)	1·163 exactly	$\lambda_e = \frac{d}{\sum\left(\frac{d_i}{\lambda_i}\right)}$ where d is the total thickness of a wall, and d_i and λ_i the thicknesses and conductivities of the wall components
British thermal unit per hour foot degree Fahrenheit	Btu/(h.ft. degF)	1·730 73	
international kilocalorie per hour square metre degree	$kcal_{IT}$/(h.m^2deg)	1·163 exactly	
British thermal unit per hour square foot degree Fahrenheit	Btu/(h.ft^2 degF)	5·678	
square metre per hour	m^2/h	0·000 278	$a = \lambda/c\rho$
square foot per hour	ft^2/h	0·000 025 8	

(*Continued from page* 1)

Members	*Representing*
SHRI H. J. LENTIN	Godrej & Boyce Mfg Co Pvt Ltd, Bombay
SHRI R. K. MAHAJAN	Research, Designs & Standards Organization (Ministry of Railways)
SHRI D. B. MALIK	Directorate General of Technical Development, New Delhi
SHRI S. N. BANWET (*Alternate*)	
SHRI MANMOHAN SINGH	Frick India Ltd, New Delhi
SHRI BACHAN SINGH (*Alternate*)	
SHRI NAUNIHAL SINGH MATHUR	National Physical Laboratory, New Delhi; *and* Indian Society of Refrigerating Engineers, Calcutta
SHRI A. P. SHIVDASANI (*Alternate*)	Indian Society of Refrigerating Engineers, Calcutta
SHRI S. N. MUKERJI	National Test House, Calcutta
SHRI B. K. MUKHERJI (*Alternate*)	
DR P. K. PANDEY	Central Mechanical Engineering Research Institute, Durgapur
SHRI V. P. PUNJ	All India Air Conditioning & Refrigeration Association, New Delhi
SHRI O. P. PURI	Voltas Limited, New Delhi
SHRI G. V. RAO (*Alternate*)	
SHRI B. J. RAMRAKHIANI	Central Labour Institute (Ministry of Labour), Bombay
SHRI C. R. SIRCAR	Directorate General of Supplies & Disposals (Ministry of Industry & Supply)
SHRI K. DUTTA (*Alternate*)	
SHRI K. SUBRAHMANYAM	Ahmedabad Textile Industry's Research Association, Ahmedabad
SHRI M. V. PATANKAR, Director (Mech Engg)	Director General, ISI (*Ex-officio Member*)

Secretary

SHRI S. P. ABBEY
Assistant Director (Mech Engg), ISI

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Basc Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	Unit	Symbol	Definition
Force	newton	N	1 N = 1 $kg.m/s^2$
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V_s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

INDIAN STANDARDS INSTITUTION

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones: 26 60 21, 27 01 31 **Telegrams: Manaksanstha**

Regional Offices:

		Telephone
Western : Novelty Chambers, Grant Road	BOMBAY 400007	6 32 92 95
Eastern : 5 Chowringhee Approach	CALCUTTA 700072	27 50 90
Southern : C. I. T. Campus	MADRAS 600113	41 24 42
Northern : B69, Phasa VII	S.A.S. NAGAR (MOHALI) 160051	8 78 26

Branch Offices:

'Pushpak', Nurmohamed Shaikh Marg, Khanpur	AHMADABAD 380001	2 03 91
'F' Block, Unity Bldg, Narasimharaja Square	BANGALORE 560002	22 48 05
Gangotri Complex, Bhadbhada Road, T. T. Nagar	BHOPAL 462003	6 27 16
22E Kalpana Area	BHUBANESHWAR 751014	5 36 27
5-8-56C L. N. Gupta Marg	HYDERABAD 500001	22 10 83
R 14 Yudhister Marg, C Scheme	JAIPUR 302005	6 98 32
117/418 B Sarvodaya Nagar	KANPUR 208005	4 72 92
Patliputra Industrial Estate	PATNA 800013	6 28 08
Hantex Bldg (2nd Floor), Rly Station Road	TRIVANDRUM 695001	32 27

ReProduced by RePrography Unit, ISI New Delhi