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Object : Herschel / Planck - HPSDB - AI#2165-09

Dear Ricardo,

Please find enclosed the ASP answer to the referenced AI : **"ASP to give the list of units to set up the unit table"**.

The following table is a customisation for Herschel / Planck project of an ESA draft table applicable to PLUTO. This customisation has been done according to following rules :

- Limitation to 4 characters (for SCOS compatibility),
- Suppression of some non SI units,
- Suppression of useless units
- Limitation on number of symbol to one,
- Changes (when the units do not look appropriate).

This table applies only for items used by SCOS (parameters, curves, ...) and HPSDB application will check it, but it does not applies for items which are not used by SCOS (constants (flight dynamics data, ...), ...).

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The naming convention will be updated accordingly to include this table.

Quantity	SI unit	Definition	HPSD Symbol	Supported multiples and submultiples of the unit
length	metre	<i>base unit</i>	"m"	"km" "cm" "mm" "um" "nm" "pm"
	astronomical unit	1 AU = 149597.870 • 10 ⁶ m	"AU"	
AREA	m ²	1 m ² = 1 m • m	"m2"	"km2" "dm2" "cm2" "mm2"
volume	m ³	1 m ³ = 1 m • m • m	"m3"	"dm3" "cm3" "mm3"
	litre	1 l = 1 dm ³	"l"	"hl" "cl" "ml"
mass	kilogram	<i>base unit</i>	"kg"	"g" "mg" "ug"
time	second	<i>base unit</i>	"s"	"ms" "us" "ns"
	minute	1 min = 60s	"min"	
	hour	1 h = 60 min	"h"	
	day	1 d = 24 h	"d"	
electric current	ampere	<i>base unit</i>	"A"	"kA" "mA" "uA" "nA" "pA"
temperature	kelvin	<i>base unit</i>	"K"	
	degree Celsius	1°C = 1 K + 273.15	"degC"	
plane angle	radian	<i>supplementary unit = m/m</i>	"rad"	"mrad" "urad"
	degree	1° = p/180 rad	"deg"	
solid angle	steradian	<i>supplementary unit = m²/m²</i>	"sr"	
frequency	hertz	1 Hz = 1 s ⁻¹	"Hz"	"THz" "GHz" "MHz" "kHz"
rotational freq.	s ⁻¹		"1/s"	"rpm"
force	newton	1 N = 1 kg m/s ²	"N"	"MN" "kN" "mN" "uN"

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Quantity	SI unit	Definition	HPSD Symbol	Supported multiples and submultiples of the unit
pressure	pascal	1 Pa = 1 N/m ²	"Pa"	"GPa" "MPa" "kPa" "mPa" "uPa"
	bar	1 bar = 10 ⁵ Pa	"bar"	"mbar" "ubar"
energy, work, heat	joule	1 J = 1 N m	"J"	"TJ" "GJ" "MJ" "kJ" "mJ"
torque	Nm	1 Nm = 1 N m = 1 J	"Nm"	"MNm" "kNm" "mNm" "uNm"
power	watt	1W = 1 J/s	"W"	"GW" "MW" "kW" "mW" "uW"
electric charge	coulomb	1 C = 1 A s	"C"	"MC" "kC" "mC" "uC" "nC" "pC"
	Ah	1 Ah = 3.6 kC	"Ah"	"mAh" "uAh"
electric potential	volt	1 V = 1 J/C	"V"	"MV" "kV" "mV" "uV"
electrical capacitance	farad	1 F = 1 C/V	"F"	"mF" "uF" "nF" "pF"
electrical resistance	ohm O	1 W = 1 V/A	"Ohm"	"GOhm" "MOhm" "kOhm" "mOhm"
electrical conductance	siemens	1 S = 1 W ⁻¹	"1S"	"kS" "mS" "uS"
magnetic flux	weber	1 Wb = 1 V s	"Wb"	"mWb"
magnetic induction	tesla	1 T = 1 Wb/m ²	"T"	"mT" "uT" "nT"
inductance	henry	1 H = 1 Wb/A	"H"	"mH" "uH" "nH" "pH"
velocity	m/s		"m/s"	
angular velocity	rad/s		"rd/s"	
	deg/s		"dg/s"	"dg/m" "dg/h"
acceleration	m/s ²		"m/s ² "	
linear mass density	kg/m		"kg/m"	"mg/m"
momentum	kg m/s		"Ns"	

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Quantity	SI unit	Definition	HPSD Symbol	Supported multiples and submultiples of the unit
angular momentum	kg m ² /s		"Nms"	
moment of inertia	kg m ²		"kgm2"	
viscosity	Pa s		"Pas"	"mPas"
volume flow rate	m ³ /s		"m3/s"	"l/s"
surface tension	N/m		"N/m"	"mN/m"
linear expansion coefficient	K ⁻¹		"1/K"	
heat capacity	J/K		"J/K"	"kJ/K"
charge density	C/m ³		"C/m3"	
surface density of charge	C/m ²		"C/m2"	
electric field strength	V/m		"V/m"	"MV/m" "kV/m" "mV/m" "uV/m"
permittivity	F/m		"F/m"	"uF/m" "nF/m" "pF/m"
electric polarization	C/m ²		"C/m2"	
electric dipole moment	C m		"Cm"	
current density	A/m ²		"A/m2"	
linear current density	A/m		"A/m"	"A/mm"
magnetic vector potential	Wb/m		"Wb/m"	
permeability	H/m		"H/m"	"uH/m" "nH/m"
electromagnetic moment	A m ²		"A m2"	
magnetization	A/m		"A/m"	"A/mm"
magnetic dipole moment	Wb m		"Wb m"	

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Quantity	SI unit	Definition	HPSD Symbol	Supported multiples and submultiples of the unit
conductivity	S/m		"S/m"	"MS/m" "kS/m"
reluctance	H ⁻¹		"1/H"	
radiant intensity	W/sr		"W/sr"	
irradiance	W/m ²		"W/m ² "	
mechanical impedance	N s/m		"Ns/m"	
TRANSMISSION RATE	bps		"bps"	"kbps" "Mbps" "Gbps"
SIGNAL LEVEL	dbW		"dbW"	"dbmW"

Table A-1 Acceptable multiples and submultiples of engineering units

Factor	Name	Symbol	Factor	Name	Symbol
10 ²⁴	yotta	Y	10 ⁻¹	deci	d
10 ²¹	zetta	Z	10 ⁻²	centi	c
10 ¹⁸	exa	E	10 ⁻³	milli	m
10 ¹⁵	peta	P	10 ⁻⁶	micro	u
10 ¹²	tera	T	10 ⁻⁹	nano	n
10 ⁹	giga	G	10 ⁻¹²	pico	p
10 ⁶	mega	M	10 ⁻¹⁵	femto	f
10 ³	kilo	k	10 ⁻¹⁸	atto	a
10 ²	hecto	h	10 ⁻²¹	zepto	z
10 ¹	deca	da	10 ⁻²⁴	yocto	y

For information only, the following changes have been done against the ESA draft table applicable to PLUTO :

. Compatibility with SCOS (limitation to 4 characters)

. Angular velocity	/ rad/s	/ "rad/s" => "rd/s"
. Angular velocity	/ deg/s	/ "deg/s" => "dg/s"
		"deg/sec" => removed
		"deg/min" => "dg/m"
		"deg/h" => "dg/h"
		"deg/hr" => removed

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. moment of inertia	/ kg m ²	/ "kg m ² "	=> "kgm ² "
. viscosity	/ Pa s	/ "Pa s"	=> "Pas"
. mechanical impedance	/ N s/m	/ "N s/m"	=> "Ns/m"
. Suppression of some non SI units (in order to limit potential conversion errors), however some of them are kept because frequently used (litre, deg°C, degree, bar, ...) or as multiple or sub-multiple :			
. Length	/ parsec	/ "pc"	
. Mass	/ atomic mass unit	/ "u"	
. Mass	/ tonne	/ "t"	
. Energy, work, heat	/ electron volt	/ "eV"	
. velocity	/ km/h	/ "km/h"	
. velocity	/ knot	/ "knot"	
. Suppression of useless units (referring to temperature differences, moles, candela, ...) :			
. temperature difference	/ kelvin	/ "K"	
. amount of substance	/ mole	/ "mol", "kmol", "mmol", "umol"	
. liminosity	/ candela	/ "cd"	
. lumineux flux	/ lumen	/ "lm"	
. illuminance	/ lux	/ "lx"	
. activity (of a radionucleide)	/ becquerel	/ "Bq"	
. absorbed dose	/ gray	/ "Gy"	
. dose equivalent	/ sievert	/ "Sv"	
. specific acoustic impedance	/ Pa s/m	/ "Pa s/m"	
. acoustic impedance	/ Pa s/m ³	/ "Pa s/m ³ "	
. kinematic viscosity	/ m ² /s	/ "M ² /s"	
. quantity of light	/ lm s	/ "lm s"	
. Luminance	/ cd/m ²	/ "cd/m ² "	
. luminous exitance	/ lm/m ²	/ "lm/m ² "	
. light exposure	/ lx s	/ "lx s"	
. luminous efficacy	/ lm/W	/ "lm/W"	
. molar mass	/ kg/mol	/ "kg/mol", "g/mol"	
. molar volume	/ m ³ /mol	/ "m ³ /mol", "l/mol"	
. molar internal energy	/ J/mol	/ "kJ/mol"	
. molar heat capacity	/ J/(mol K)	/ "J/(mol K)"	
. concentration of substance B	/ mol/m ³	/ "mol/m ³ "	
. molarity of solute substance B	/ mol/kg	/ "mol/kg"	
. density	/ kg/m ³	/ "kg/m ³ ", "kg/l", "g/l"	
. linear mass density	/ kg/m	/ "kg/m", "mg/m"	
. thermal conductivity	/ W(m K)	/ "W/(m K)"	
. coefficient of heat transfer	/ W/(m ² K)	/ "W/(m ² K)"	

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. specific heat capacity	/ J/(kg K)	/ "J/(kg K)"	
. specific internal energy	/ J/kg	/ "MJ/kg", "kJ/kg"	
. electric polarization	/ C/m ²	/	"kC/m ² ",
"mC/m ² ", "uC/m ² "			
. current density	/ A/m ²	/ "A/mm ² "	
. resistivity	/ O m	/ "Ohm m", "GOhm m", "KOhm m", "mOhm m"	
. radiance	/ W/(sr m ²)	/ "W/(sr m ²)"	
. Limitation of number of symbol to one :			
. volume	/ litre	/ "L"	=> removed
. time	/ second	/ "sec"	=> removed
. time	/ hour	/ "hr"	=> removed
. time	/ day	/ "day"	=>
removed			
. Changes :			
. temperature	/ kelvin	/ "kabs"	=> "K"
. Rotational frequency	/ S ⁻¹	/ "1/min"	=> "rpm"
. momentum	/ N.s	/ "kg m/s"	=> "Ns"
. angular momentum	/ N.m.s	/ "kg m ² /s"	=> "Nms"

This fax closes the referenced action item.

Best regards.

Author :

Authorised by :