List of physical quantities

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The first table lists the base quantities used in the International System of Units to define the physical dimension of physical quantities for dimensional analysis. Note that the angle and solid angle are included in this list but are actually dimensionless quantities. The second table list the other physical quantities.The final column lists some special properties some of the quantities have such as their scaling behavior (if the quantity is intensive or extensive), their transformation properties (if the quantity is a scalar, vector or tensor) or whether the quantity is conserved.

Base quantity	Symbol	Description	SI unit	Symbol for dimension	Comments
Length	*l*	The one-dimensional extent of an object.	metre (m)	**L**	
Mass	*m*	The amount of matter in an object.	kilogram (kg)	**M**	extensive, scalar
Time	*t*	The duration of an event.	second (s)	**T**	scalar
Electric current	*I*	Rate of flow of electrical charge.	ampere (A)	**I**	

Temperature	*T*	Average energy per degree of freedom of a system.	kelvin (K)	**Θ**	intensive, scalar
Amount of substance	*n*	Number of particles compared to the number of atoms in 0.012 kg of ^{12}C.	mole (mol)	**N**	extensive, scalar
Luminous intensity	*L*	Amount of energy emitted by a light source in a particular direction.	candela (cd)	**J**	scalar

Derived quantity	Symbol	Description	SI units	Dimension	Comments
Plane angle	θ	Measure of a change in direction or orientation.	radian (rad)	**1**	
Solid angle	Ω	Measure of the size of an object as projected on a sphere.	steradian (sr)	**1**	

Absorbed dose rate		Absorbed dose received per unit of time.	Gy s^{-1}	$\mathbf{L^2\,T^{-3}}$	
Acceleration	$a\longrightarrow$	Rate of change of the speed or velocity of an object.	m s^{-2}	$\mathbf{L\,T^{-2}}$	vector
Angular acceleration	α	Rate of change in angular speed or velocity.	rad s^{-2}	$\mathbf{T^{-2}}$	
Angular speed (or*angular velocity*)	ω	The angle incremented in a plane by a segment connecting an object and a reference point per unit time.	rad s^{-1}	$\mathbf{T^{-1}}$	scalar or pseudovector
Angular momentum	$\boldsymbol{L}$	Measure of the extent and direction an object rotates about a reference point.	kg m^2 s^{-1}	$\mathbf{M\,L^2\,T^{-1}}$	conserved quantity, pseudovector
Area	A	The two-dimensional extent of an object.	m^2	$\mathbf{L^2}$	scalar

Area density	ρ_A	The amount of mass per unit area of a two-dimensional object.	kg m^{-2}	**M L**$^{-2}$	
Capacitance	C	Measure for the amount of stored charge for a given potential.	farad (F = A^2 s^4 kg^{-1} m^{-2})	**I**^{2} **T**^{4} **M**$^{-1}$ **L**$^{-2}$	scalar
Catalytic activity		Change in reaction rate due to presence of a catalyst.	katal (kat = mol s^{-1})	**N T**$^{-1}$	
Catalytic activity concentration		Change in reaction rate due to presence of a catalyst per unit volume of the system.	kat m^{-3}	**N L**$^{-3}$ **T**$^{-1}$	
Chemical potential	μ	The amount of energy needed to add a particle to a system.	J mol^{-1}	**M L**^{2} **T**$^{-2}$ **N**$^{-1}$	intensive
Molar concentration	C	Amount of substance per unit volume.	mol m^{-3}	**N L**$^{-3}$	intensive
Crackle	$c\longrightarrow$	Rate of change of Jounce. The fifth derivative of position.	m s^{-5}	**L T**$^{-5}$	Vector

Current density	$J \rightarrow$	Amount of electric current flowing through a surface.	A m^{-2}	**I** **L**$^{-2}$	vector
Dose equivalent	H	Measure for the received amount of radiation adjusted for the effect of different types of radiant on biological tissue.	sievert (Sv = m^2 s^{-2})	**L**^{2} **T**$^{-2}$	
Dynamic Viscosity	η	Measure for the resistance of an incompressible fluid to stress.	Pa s	**M** **L**$^{-1}$ **T**$^{-1}$	
Electric Charge	Q	Amount of electric charge.	coulomb (C = A s)	**I** **T**	extensive, conserved quantity
Electric charge density	ρ_Q	Amount of electric charge per unit volume.	C m^{-3}	**I** **T** **L**$^{-3}$	intensive
Electric displacement	D	Strength of the electric displacement.	C m^{-2}	**I** **T** **L**$^{-2}$	vector field

Electric field strength	$E\longrightarrow$	Strength of the electric field.	V m^{-1}	**M L T^{-3} I^{-1}**	vector field
Electrical conductance	G	Meausure for how easily current flows through a material.	siemens (S = A^2 s^3 kg^{-1} m^{-2})	**L^{-2} M^{-1} T^3 I^2**	scalar
Electric potential	V	The amount of work required to bring a unit charge into an electric field from infinity.	volt (V = kg m^2 A^{-1} s^{-3})	**L^2 M T^{-3} I^{-1}**	scalar
Electrical resistance	R	The degree to which an object opposes the passage of an electric current.	ohm (Ω = kg m^2 A^{-2} s^{-3})	**L^2 M T^{-3} I^{-2}**	scalar
Energy	E	The capacity of a body or system to do work.	joule (J = kg m^2 s^{-2})	**M L^2 T^{-2}**	extensive, scalar, conserved quantity
Energy density	ρ_E	Amount of energy per unit volume.	J m^{-3}	**M L^{-1} T^{-2}**	intensive
Entropy	S	Measure for the amount of available states for a system.	J K^{-1}	**M L^2 T^{-2} Θ $^{-1}$**	extensive, scalar

Force	$F\longrightarrow$	The cause of acceleration, acting on an object.	newton (N = kg m s^{-2})	**M L T**$^{-2}$	vector
Fuel efficiency	*mpg*	Distance traveled per meter cubed.	fuel efficiency (mpg = m m^{-3}	**M M**$^{-3}$	scalar
Impulse	$p\longrightarrow$	The cause of a change in momentum, acting on an object.	kg m s^{-1}	**M L T**$^{-1}$	vector
Frequency	*f*	The number of times something happens in a period of time.	hertz (Hz =s^{-1})	**T**$^{-1}$	scalar
Half-life	$t_{1/2}$	The time needed for a quantity to decay to half its original value.	s	**T**	
Heat	*Q*	Amount of energy transferred between systems due to temperature difference.	J	**M L**^{2} **T**$^{-2}$	
Heat capacity	C_p	Amount of energy needed to raise the temperature of a system by one degree.	J K^{-1}	**M L**^{2} **T**$^{-2}$ **Θ**$^{-1}$	extensive

Heat flux density	ϕ_Q	Amount of heat flowing through a surface per unit area.	W m^{-2}	**M T**$^{-3}$	
Illuminance	E_v	Total luminous flux incident to a surface per unit area.	lux (lx = cd sr m^{-2})	**J L**$^{-2}$	
Impedance	Z	Measure for the resistance of an electrical circuit against an alternating current.	ohm (Ω = kg m^2 A^{-2} s^{-3})	**L**^{2} **M T**$^{-3}$ **I**$^{-2}$	complex scalar
Index of refraction	n	The factor by which the speed of lightis reduce in a medium.		**1**	intensive , scalar
Inductance	L	Measure for the amount of magnetic flux generated for a certain current run through a circuit.	henry (H = kg m^2 A^{-2} s^{-2})	**M L**^{2} **T**$^{-2}$ **I**$^{-2}$	scalar
Irradiance	E	Power of electromagnetic radiation flowing through a surface per unit area.	W m^{-2}	**M T**$^{-2}$	
Intensity	I	Power per unit cross sectional area.	W m^{-2}	**M T**$^{-2}$#	

Jerk	$\vec{j}$	Rate of change of acceleration. The third derivative of position.	m s^{-3}	**L** $\mathbf{T}^{-3}$	Vector
Jounce (or *snap*)	$\vec{s}$	Rate of change of Jerk. The fourth derivative of position.	m s^{-4}	**L** $\mathbf{T}^{-4}$	Vector
Linear density	ρ_l	Amount of mass per unit length of a one-dimensional object.		**M** $\mathbf{L}^{-1}$	
Luminous flux (or*luminous power*)	F	Perceived power of a light source.	lumen (lm = cd sr)	**J**	
Mach Number (or*mach*)	M	Ratio of flow velocity to the local speed of sound.	Unitless (M = u/c)	**1**	
Magnetic field strength	H	Strength of a magnetic field in a material.	A m^{-1}	**I** $\mathbf{L}^{-1}$	vector field
Magnetic flux	Φ	Measure of quantity of magnetism, taking account of	weber (Wb = kg m^2 A^{-1} s^{-2})	**M** $\mathbf{L}^2$ $\mathbf{T}^{-2}$ $\mathbf{I}^{-1}$	scalar

		the strength and the extent of a magnetic field.			
Magnetic flux density	B	Measure for the strength of the magnetic field.	tesla (T = kg A^{-1} s^{-2})	$\mathbf{M\,T^{-2}\,I^{-1}}$	pseudovector field
Magnetization	M	Amount of magnetic moment per unit volume.	A m^{-1}	$\mathbf{I\,L^{-1}}$	vector field
Mass fraction	x	Mass of a substance as a fraction of the total mass.	kg/kg	**1**	intensive
(Mass) Density (or*volume density*)	ρ	The amount of mass per unit volume of a three-dimensional object.	kg m^{-3}	$\mathbf{M\,L^{-3}}$	intensive
Mean lifetime	τ	Average time needed for a particle to decay.	s	**T**	intensive
Molar energy		Amount of energy present is a system per unit amount of substance.	J mol^{-1}	$\mathbf{M\,L^2\,T^{-2}\,N^{-1}}$	intensive

Molar entropy		Amount of entropy present in a system per unit amount of substance.	J K^{-1} mol^{-1}	**M** $\mathbf{L}^2$ $\mathbf{T}^{-2}$ $\mathbf{\Theta}^{-1}$ $\mathbf{N}^{-1}$	intensive
Molar heat capacity	*c*	Heat capacity of a material per unit amount of substance.	J K^{-1} mol^{-1}	**M** $\mathbf{L}^2$ $\mathbf{T}^{-2}$ $\mathbf{N}^{-1}$	intensive
Moment of inertia	*I*	Inertia of an object with respect to angular acceleration.	kg m^2	**M** $\mathbf{L}^2$	tensor, scalar
Momentum	$p\longrightarrow$	Product of an object's mass and velocity.	N s	**M L** $\mathbf{T}^{-1}$	vector, extensive
Permeability	μ	Measure for how the magnetization of material is affected by the application of an external magnetic field.	H m^{-1}	**M L** $\mathbf{T}^{-2}$ $\mathbf{I}^{-2}$	intensive
Permittivity	ε	Measure for how the polarization of a material is affected by the application of an external electric field.	F m^{-1}	$\mathbf{I}^2$ $\mathbf{M}^{-1}$ $\mathbf{L}^{-3}$ $\mathbf{T}^4$	intensive

Power	*P*	The rate of change in energy over time.	watt (W)	$\mathbf{M\,L^2\,T^{-3}}$	extensive, scalar
Pressure	*p*	Amount of force per unit area.	pascal (Pa = kg m^{-1} s^{-2})	$\mathbf{M\,L^{-1}\,T^{-2}}$	intensive, scalar
Pop	$p\longrightarrow$	Rate of change of crackle. The sixth derivative of position.	m s^{-6}	$\mathbf{L\,T^{-6}}$	Vector
(Radioactive) Activity	*A*	Number of particles decaying per unit time.	becquerel (Bq = s^{-1})	$\mathbf{T^{-1}}$	extensive, scalar
(Radioactive) Dose	*D*	Amount of energy absorbed by biological tissue from ionizing radiation per unit mass.	gray (unit) (Gy = m^2 s^{-2})	$\mathbf{L^2\,T^{-2}}$	
Radiance	*L*	Power of emitted electromagnetic radiation per solid angle and per projected source area.	W m^{-2} sr^{-1}	$\mathbf{M\,T^{-3}}$	
Radiant intensity	*I*	Power of emitted electromagnetic radiation per solid angle.	W sr^{-1}	$\mathbf{M\,L^2\,T^{-3}}$	scalar

Reaction rate	*r*	Measure for speed of a chemical reaction.	mol m^{-3} s^{-1}	**N** L^{-3} T^{-1}	intensive, scalar
Refractive Index	*n*	Measure of how light is refracted through a medium.	Unitless	Dimensionless	
Speed	*v*	Rate of change of the position of an object.	m s^{-1}	**L** T^{-1}	scalar
Specific energy		Amount of energy present per unit mass.	J kg^{-1}	L^2 T^{-2}	intensive
Specific heat capacity	*c*	Heat capacity per unit mass.	J kg^{-1} K^{-1}	L^2 T^{-2} Θ^{-1}	intensive
Specific volume	*v*	The volume occupied by a unit mass of material (reciprocal of density).	m^3 kg^{-1}	L^3 M^{-1}	intensive
Spin	*S*	Intrinsic property of particles, roughly to be interpreted as the intrinsicangular momentum of the particle.	kg m^2 s^{-1}	**M** L^2 T^{-1}	
Strain		Extension per unit length.	Unitless	Dimensionless	

Stress	σ	Amount of force exerted per surface area.	Pa	$\mathbf{M\,L^{-1}\,T^{-2}}$	2-tensor. (or scalar)
Surface tension	γ	Amount of work needed to change the surface of a liquid by a unit surface area.	$N\,m^{-1}$ or $J\,m^{-2}$	$\mathbf{M\,T^{-2}}$	
Thermal conductivity	k	Measure for the ease with which a material conducts heat.	$W\,m^{-1}\,K^{-1}$	$\mathbf{M\,L\,T^{-3}\,\Theta^{-1}}$	intensive
Torque	τ	Product of a force and the perpendicular distance of the force from the point about which it is exerted.	N m	$\mathbf{M\,L^2\,T^{-2}}$	pseudovector
Velocity	$v\rightarrow$	Speed of an object in a chosen direction.	$m\,s^{-1}$	$\mathbf{L\,T^{-1}}$	vector
Volume	V	The three dimensional extent of an object.	m^3	$\mathbf{L^3}$	extensive, scalar
Wavelength	λ	Distance between repeating units of a propagating wave.	m	**L**	

Wavenumber	*k*	Reciprocal of the wavelength.	m^{-1}	$\mathbf{L}^{-1}$	
Weight	*w*	Amount of gravitation force exerted on an object.	newton (N = kg m s^{-2})	$\mathbf{M\,L\,T}^{-2}$	Vector
Work	*W*	Energy dissipated by a force moving over a distance, scalar product of the force and the movement vector.	joule (J = kg m^2 s^{-2})	$\mathbf{M\,L}^{2}\,\mathbf{T}^{-2}$	scalar
Young's modulus		Ratio of Stress over Strain.	pascal (Pa = kg m^{-1} s^{-2})	$\mathbf{M\,L}^{-1}\,\mathbf{T}^{-2}$	scalar