unitsdef – Typesetting units with $\LaTeX 2_{\varepsilon}^*$

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Abstract

There are a lot of packages for type setting units in LaTeX 2ε . Some define macros to type set a lot of units but do not suit to the actual font settings, some make the characters needed available but do not predefine any unit.

This package tries to comply with both requirements. It predefines common units, defines an easy to use interface to define new units and changes the output concerning to the surrounding font settings.

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Changes

v0.1	stead of \newcommand 18
General: First public release 1	Added code for the use of xs-
v0.11	pace
General: Added electronvolt 1	Now unitsdef uses \unitvaluesep
v0.12	inistead of \setminus , thereby the in-
General: Fixed some bugs relating	terface is more flexible and
to gensymb. $\dots \dots 1$	allows the users to commit
v0.13	changes 19
General: Some bugfixes and some	\renewunit: Added code
units added. $\dots \dots 1$	for the use of xspace.
v0.13a	\DeclareRobustCommand
General: More bugfixes. \utimes	is used instead of
is now called \unittimes 1	\renewcommand 19
v0.2	\SI: Added \SI to typeset units
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and \renewnosepunit for	rules 24
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1 Packages loaded by unitsdef

unitsdef loads (and so needs) the following packages with the given options:

- [T1]fontenc
- textcomp
- amsmath
- units
- xspace (as long as noxspace, see section 3.2, isn't specified)

The first two packages are needed for different characters in the encodings set by these packages, amsmath provides the very useful \text macro and units is used for typesetting the units. xpsace is included to obtain the facility to write 5\mm and some text instead of 5\mm\ and some text.

2 General usage

To use unitsdef simply specify

 $\usepackage[\langle options \rangle] \{unitsdef\}$

in the preamble of your document.

3 Options

3.1 Options related to gensymb

unitsdef knows three options to avoid conflicts with the gensymb-package that also predefines macros for typesetting μ , Ω and Ω . Some macros are definied both by gensymb and unitsdef. To solve this problem three different options exist:

OHM makes unitsdef use uppercase macros (\Ohm, \Celsius, \Micro and \Degree). The predefined units with prefixes still appear lowercase (\kiloohm).

 ${f ohm}$ is the opposite to OHM and is the default setting.

redef-gensymb This option copies \ohm, \celsius, \micro and \degree from gensymb to \gensymbohm, \gensymbcelsius, \gensymbmicro and \gensymbdegree. unitsdef then redefines this four commands so that they have the same meaning as without gensymb. Important: To use this option gensymb has to be loaded before unitsdef!

3.2 More options

unitsdef knows some other options to change its behaviour:

LITER Makes unitsdef use the *uppercase* L as the sign produced by \liter. This is default behaviour.

liter Makes unitsdef use the *lowercase* l as the sign produced by \liter.

noxspace Maybe some problems occur due to the xspace functionality of unitsdef. This option forces unitsdef to do without xspace.

noconfig Tells unitsdef not to look for a local unitsdef configuration file unitsdef.cfg (see section 6 for details).

noabbrv Is an abbreviation for *no abbreviations*. unitsdef does not define any short commands for a unit. This might be helpfull if another package defines a command with the same name and LATEX exits with an error.

ugly Applies the option **ugly** to **units**, thus all units containing fraction will be typeset like m/s in text mode and $\frac{m}{s}$ in mathmode.

skipping only particular abbreviations Usually only one macro causes conflict between a definition made by unitsdef and another package. There are some options to avoid loading only particular abbreviations to avoid the definition that causes the conflict:

noamperageabbr Avoids defining the abbreviations for units of amperage (\pA, \nA, \max., \kA).

nofrequncyabbr Avoids defining \kHz, \MHz and \GHz.

nomolabbr Avoids defining \fmol, \pmol, \nmol, \micmol and \mmol. novoltageabbr Avoids defining \kV and \mv.

novolumeabbr Avoids defining \f1, \p1, \n1, \mic1, \m1, \cl and \d1.
noweightabbr Avoids defining \kg, \fg, \pg, \nanog, \micg and \mg.
noenergyabbr Avoids defining \kJ, \eV, \meV, \keV, \MeV, \GeV and \TeV.

notimeabbr Avoids defining \sek, \fs, \ps, \ns, \mics and \ms.

4 Typesetting units

unitsdef includes a large set of predefined units. They are listed in section 7. These units, as well as units defined by you with \newunit (see below), can be used as follows:

As you see, the value is an optional argument. Thus you can write 5\kg (instead of \kg[5]), this may simplify the writing process. The distance in both cases is \unitvaluesep.

If the optional argument is not used you still can write 5\kg and some text due to the xspace functionality of unitsdef.

\unitvaluesep

If you want another distance between value and unit you simply have to redefine \unitvaluesep:

 $\mbox{\command{\unitvaluesep}{\hspace*{\distance}}}$

\unitsignonly

If you want to typeset the sign of a unit without any value (for introducing a new unit-sign f.e.) \unitvaluesep must not be set. This is provided by the macro \unitsignonly{\\unitmacro>}.

Important! If you want to specify a unit with a prefix, never use something like \milli\hour. This will lead to problems. Always define the units first using \newunit or use the command \ilu to typeset an unit without defining it first!

4.1 Inline units

\ilu

Some packages for typesetting units provide the possibility to write things like \micro\meter to obtain \mu. With unitsdef this will cause some problems due to the toggling of some internal switches. If you want to use prefices without defining a new unit you have to use the command \ilu. It has one optional and one mandatory argument. The first contains the value to be typeset, the

latter contains the unit:

```
A force of \ilu[17]{\micro\newton} is applied. $F=17\ilu{\micro\newton}$ \textsf{17\ilu{\micro\newton}}
```

```
A force of 17 \upmu{\rm N} is applied. F=17\,\upmu{\rm N} 17 \upmu{\rm N}
```

4.2 Typesetting angles and arcs

If you type 5\degree10\arcmin12\arcsec you will get the following result: »5° 10′ 12″ «. There are full spaces between the single values and the preceding unit-symbol. This is due to the xspace functionality of unitsdef. The correct output you will obtain by using the macro \arc¹. Using it in this way \arc{5;10;12} will lead to »5° 10′ 12″«. There are some more features of this macro, best understood if you look at this example:

```
\begin{enumerate}
                                         1. 1°
  \item \arc{1}
                       % 1
                                         2. 1°2′
  \left( 1;2 \right)
                       % 2
                                        3. 1°2′3″
  \left(1;2;3\right)
                       % З
  \item \arc{;2;3}
                       % 4
                                         4. 0°2′3″
  \item \arc{;;3}
                       % 5
                                        5. 0^{\circ}0'3''
                       % 6
  \left(1;;2\right)
                                        6. 1°0′2″
  \item \arc{1;;}
                       % 7
  \item \arc{;;;}
                       % 8
                                         7. 1°
\end{enumerate}
                                        8.
```

4.3 Logical markup for units

One advantage of unitsdef is that it typesets the units suiting to the surrounding font settings. But some people (magazines, universities, ...) want units always to be typeset in a special way. There is a checklist available at http://physics.nist.gov/cuu/Units/checklist.html. unitsdef does not fit to all these requirements by default. But there are some macros for figuring out the output. First, there is the command \SI which typesets (by default) all units in upright shape, but doesn't change anything else according to the font settings. The command \SI has two mandatory arguments, the

 $^{^1\}mathrm{It}$ is expected to have (nearly?) the same usage and results as **\ang** from the SIstyle package.

first has to contain the value, the latter contains the unit:

```
\textbf{\textit{A force of
\SI{17}{\newton}
was applied.}}
```

A force of 17 N was applied.

If you want to customize the output of \SI, you can redefine the macro \unitSIdef. By default it contains \upright, but if you want units to be typeset upright in serif family, you can achieve this by redefining it to \upshape\rmfamily:

```
\renewcommand{\unitSIdef}
    {\upshape\rmfamily}
\textsf{\textbf{\textit{%}
    A force of
    \SI{17}{\newton}
    was applied.}}}
```

A force of 17 N was applied.

5 The interface

5.1 Defining new units

\newunit

Besides the predefined unit-macros (see section 7) unitsdef offers the possibility to define new units. This is done with the macro \newunit:

```
\verb|\newunit|{\|\langle unitmacro\rangle\}} {\|\langle unitsign\rangle}|
```

To typeset a unit Newton (represented by N) you have to define² it as follows:

```
\newunit{\newton}{N}
```

After this you can use the macro \newton:

```
5\newton plus \newton[3] is 8\newton.
```

This will give the following output:

```
5 \,\mathrm{N} plus 3 \,\mathrm{N} is 8 \,\mathrm{N}.
```

To define a unit *millinewton* (mN) simply define:

```
\newunit{\millinewton}{\milli\newton}
```

\renewunit

For redefining units, the macro \renewunit can be used with the same syntax as \newunit (on the lines of \newcommand and \renewcommand).

\newnosepunit

As an additional facility to define new units the macro \newnosepunit exists with the same syntax as \newunit. It allows you to define a unit without any space between the value and the unit-symbol. The only unit I know typeset without leading space is *degree*. You typeset 5° instead of 5°. But maybe there are other units that must not have leading space, so I included this command in the user interface.

\renewnosepunit

If you want to redifine a unit to be typeset without leading space, use \renewnosepunit.

\per

To typeset units containing a fraction the macro \per is defined. The usage is:

```
\protect\operatorname{\begin{tabular}{l} \protect\begin{tabular}{l} \protect\begin{tabula
```

To define newton per squaremeter you have to say:

```
\newunit{\newtonpersmeter}{\per{\newton}{\squaremeter}}
```

\unittimes

To typeset a multiplication sign between two units the macro $\$ is used:

```
\newunit{\newtonmeter}{\newton\unittimes\meter}
\newunit{\newtonmeterpersec}{\per{\newton\unittimes\meter}{\second}}
```

\unitsep

To typeset additional space (instead of \unittimes) between two units you can use \unitsep (do NOT use \,):

```
\newunit{\newtonmeter}{\newton\unitsep\meter}
```

The default is $\$, but if you want different amount of space you can simply $\$ renewcommand{unitsep}{ $\langle distance \rangle$ }.

\unitsuperscript

To typeset superscripts use \unitsuperscript:

5.2 Typesetting μ , Ω , ° and °C

\setTextOmega

Typesetting units would be quite easy without Ohm and micro (degree and de-

\setMathOmega \setTextmu

 $^2{\rm You}$ do not really have to define newton, it is already defined by ${\sf unitsdef}.$ This is just an example.

\setMathmu

\setmatimit

\setTextCelsius

\setMathCelsius

\setMathDegree

\setTextDegree

8

gree Celsius as well). The representing characters μ and Ω have to exist in three variants: One for use in math-mode (suiting to \mathrm) the latter two for use in \rmfamily and \sffamily. Most fonts have a suiting μ but very few fonts own a Ω . The fonts from BITSTREAM (delivered with some versions of COREL DRAW) have an italic non-suiting μ , so you have to take care of a μ when using such fonts, too. Also the μ in Latin Modern fonts isn't very good looking yet (but LM is still in beta-state). Because of nearly infinite combinations of different fonts it is impossible to choose the correct characters for μ , Ω and °C automatically. To define these characters use the macros \setTextOmega, \setMathOmega, \setTextmu, \setMathmu, \setTextCelsius, \setMathCelsius, \setMathCelsius, \setMathDegree and \setTextDegree:

```
\label{eq:continuous} $$\operatorname{TextOmega}_{\langle efinition\rangle}_{\langle sans-serif-definition\rangle}_{\langle efinition\rangle}_{\langle efinition\rangle}_{\langle sans-serif-definition\rangle}_{\langle efinition\rangle}_{\langle efinition\rangle}_{\langle
```

Important! The macros concerning typesetting in math-mode use amsamth's \text-macro. So you have to switch to math-mode to use a character out of the math alphabet. The reason for this is units. units uses \mathrm to typeset in math-mode. But only few mathfonts have a suitable Ω , for example:

unitsdef sets the defaults in a way suitable to the CM-family:

```
\setMathOmega{$\mathrm{\Omega}$}
\setMathmu{\textmu}
\setTextOmega{\textohm}{\textohm}
```

```
\setTextmu{\textmu}{\textmu}
\setMathCelsius{\textcelsius}
\setTextCelsius{\textcelsius}{\textcelsius}
\setMathDegree{\textdegree}
\setTextDegree{\textdegree}{\textdegree}
```

To find a suitable Ω for different fonts use Walter Schmidt's gensymb-package³ and read the documentation of this package.

6 Local configuration file

Since version 0.2 units def by default looks for a file unitsdef.cfg and inputs its contents. This is useful if you frequently use a similar set of units in your documents. You put your definitions in unitsdef.cfg and they are included automaticly in your document⁴

A configuration file may look like this:

```
\ProvidesFile{unitsdef.cfg}%
   [2004/12/09 v1.0 some definitions for unitsdef]
\newunit{\molar}{\per{\mole}{\liter}}
\newunit{\millimolar}{\per{\millimole}{\liter}}
\endinput
```

If, by some reason, you don't want your local config file to be loaded specify the option noconfig in the \usepackage command.

7 Predefined units and prefices

Table 1: predefined preficies

name	prefix	macro	value	name	prefix	macro	value
yocto	У	\yocto	10^{-24}	zepto	Z	\zepto	10^{-21}

 $^{^3\}mathtt{CTAN:macros/latex/contrib/was/}$

⁴Keep in mind that T_EX has to find the file, so follow the instructions given by your T_EX-distribution. On *nix-like systems and a TDS compliant distribution it might be possible to put unitsdef.cfg in ~/texmf/tex/latex/unitsdef/config/ and update the filename database.

Table 1: predefined preficies

name	prefix	macro	value	name	prefix	macro	value
atto pico	a p	\atto \pico	$10^{-18} \\ 10^{-12}$	femto nano	f n	\femto \nano	$10^{-15} \\ 10^{-9}$
micro	μ	\micro	10^{-6}	milli	m	\milli	10^{-3}
centi	c	\centi	10^{-2}	deci	d 1-	\deci	10^{-1} 10^{+2}
deca kilo	da k	\deca \kilo	10^{+1} 10^{+3}	hecto mega	h M	\hecto \mega	10^{+2} 10^{+6}
giga peta	G P	\giga \peta	$10^{+9} \\ 10^{+15}$	tera exa	$_{ m E}^{ m T}$	\tera \exa	$10^{+12} \\ 10^{+18}$
zetta	Z	\zetta	10^{+21}	yotta	Y	\yotta	10^{+24}

Table 2: predefined units

name	sign	macro	alias
base units			
meter	\mathbf{m}	\meter	
kilogram	$_{ m kg}$	\kilogram	\kg
mole	mol	\mole	
second	S	\second	\sek
ampere	A	\ampere	
kelvin	K	\kelvin	
candela	cd	\candela	
units of length			
picometer	pm	\picometer	\picom
nanometer	nm	\nanometer	\nm
micrometer	$\mu\mathrm{m}$	\micrometer	\micm
millimeter	mm	\millimeter	\mm
centimeter	cm	\centimeter	\cm
decimeter	dm	\decimeter	$\d m$
kilometer	km	\kilometer	\km
units of weight			
gram	g	\gram	
femtogram	fg	\femtogram	\fg
picogram	pg	\picoram	\pg

Table 2: predefined units

name	sign	macro	alias
nanogram	ng	\nanogram	\nanog
microgram	μg	\microgram	\micg
milligram	mg	\milligram	\mg
units of amount of subst	ance		
femtomole	fmol	\femtomole	\fmol
picomole	pmol	\picomole	\pmol
nanomole	nmol	\nanomole	\n
micromole	μmol	\micromole	\micmol
millimole	mmol	\millimole	\mmol
units of time			
attosecond	as	\attosecond	
femtosecond	fs	\femtosecond	\fs
pikosecond	$_{\mathrm{ps}}$	\picosecond	\ps
nanosecond	$_{ m ns}$	\nanosecond	\ns
microsecond	μs	\microsecond	\mics
millisecond	${ m ms}$	\millisecond	\ms
units of amperage			
picoampere	pA	\picoampere	\pA
nanoampere	nA	\nanoampere	\nA
microampere	μA	\microampere	$\mbox{\mbox{\tt micA}}$
milliampere	mA	\milliampere	\mbox{mA}
kiloampere	kA	\kiloampere	\kA
units of volume			
liter	L	\liter	
femtoliter	${ m fL}$	\femtoliter	\fl
picoliter	pL	\picoliter	\pl
nanoliter	nL	\nanoliter	\nl
microliter	$\mu \mathrm{L}$	\microliter	\micl
milliliter	mL	\milliliter	\ml
centiliter	cL	\centiliter	\cl
deciliter	$\mathrm{d}\mathrm{L}$	\deciliter	\dl
hectoliter	hL	\hectoliter	\hl
cubicmeter	m^3	\cubicmeter	
cubicmicrometer	$\mu\mathrm{m}^3$	\cubicmicrometer	
cubicmillimeter	mm^3	\cubicmillimeter	

Table 2: predefined units

name	sign	macro	alias
units of area			
squaremeter	m^2	\squaremeter	
ar	\mathbf{a}	\ar	
Hektar	ha	\hektar	
squarecentimeter	${ m cm}^2$	\squarecentimeter	
squaremillimeter	mm^2	\squaremillimeter	
squarekilometer	km^2	\squarekilometer	
more units of weight			
ton	\mathbf{t}	\ton	
derived units of electricity	y		
volt	V	\volt	
millivolt	mV	\millivolt	$\mbox{\em V}$
kilovolt	kV	\kilovolt	\kv
Watt	W	\watt	
milliwatt	mW	\milliwatt	
kilowatt	kW	\kilowatt	
megawatt	MW	\megawatt	
coulomb	\mathbf{C}	\coulomb	
ohm	Ω	\ohm or \Ohm	
kiloohm	$\mathrm{k}\Omega$	\kiloohm	
megaohm	$\mathrm{M}\Omega$	$\mbox{\tt megaohm}$	
gigaohm	$G\Omega$	\gigaohm	
siemens	\mathbf{S}	\siemens	
millisiemens	mS	\millisiemens	
farad	\mathbf{F}	\farad	
femtofarad	fF	\femtofarad	
picofarad	pF	\picofarad	
nanofarad	nF	\nanofarad	
microfarad	μF	\microfarad	
millifarad	mF	\millifarad	
units of energy			
joule	J	\joule	
millijoule	mJ	\millijoule	
kilojoule	kJ	\kilojoule	\kJ
megajoule	MJ	\megajoule	

Table 2: predefined units

name	sign	macro	alias
calorie	cal	\calory	
kilocalorie	kcal	\kilocalory	
electronvolt	eV	\electronvolt	\eV
millielectronvolt	meV	\millielectronvolt	$\mbox{\tt meV}$
kiloelectronvolt	keV	\kiloelectronvolt	\keV
megaelectronvolt	MeV	\megaelectronvolt	\MeV
gigaelectronvolt	${ m GeV}$	\gigaelectronvolt	\GeV
teraelectronvolt	${ m TeV}$	\teraelectronvolt	\TeV
more units of time			
minute	\min	\minute	
hour	${ m h}$	\hour	
days	d	\days	
units of temperature		·	
degree Celsius	$^{\circ}\mathrm{C}$	\celsius or \Celsius	
units of angle			
radian	rad	\radian	
steradian	sr	\steradian	
degree	0	\degree or \Degree	
arc minute	,	\arcmin	
arc second	″	\arcsec	
units of frequencies			
hertz	$_{\mathrm{Hz}}$	\hertz	
kilohertz	kHz	\kilohertz	\kHz
megahertz	MHz	\megahertz	\MHz
gigahertz	GHz	\gigahertz	\GHz
units of force			
newton	N	\newton	
millinewton	mN	\millinewton	
kilonewton	kN	\kilonewton	
units of pressure			
pascal	Pa	\pascal	
hectopascal	hPa	\hectopascal	
bar	bar	\uBar	
millibar	mbar	\millibar	
111111001	шы	/m++++>\alpha+	

Table 2: predefined units

name	sign	macro	alias
units of magnetism			
weber	Wb	\weber	
tesla	${ m T}$	\tesla	
henry	H	\henry	
units of light			
lumen	lm	\lumen	
lux	lx	\lux	
units of radioactivity			
becquerel	Bq	\becquerel	
megabecquerel	$\overline{\mathrm{MBq}}$	\megabecquerel	
curie	Cu	\curie	
sievert	Sv	\sievert	
millisievert	mSv	\millisievert	
percent			
percent	%	\percent	

8 To Do

There are a lot of things to be done. Some are mentioned here:

- Add some more macros to figure out the ouptut (something similar to \SI). Provide the possibility to typeset all units in math mode.
- Improve the documentation.
- Adding interfaces units for Å, ‰ and °F

9 Code

 $_1 \langle *package \rangle$

9.1 switches

\if@@setunitsep

This switch is used internally to decide, whether a distance is to be typesetted or not.

- $2 \neq 2$
- 3 \@@setunitseptrue

This switch decides whether \ohm or \Ohm and \celsius or \Celsius is defined (according to gensymb).

- 4 \newif\ifunit@@Ohm%
- 5 \unit@@Ohmfalse

\ifunit@@redefgensymb

This switch makes gensymb's macros \ohm and \celsius available as \gensymbohm and \gensymbcelsius. unitsdef uses \ohm and \celsius.

- 6 \newif\ifunit@@redefgensymb
- 7 \unit@@redefgensymbfalse

\ifunit@@liter This switch decides whether the output of the unit \iter is typeset as 1 or L

- 8 \newif\ifunit@@liter
- 9 \unit@@literfalse

\ifunit@@xspace

This switch decides whether xspace is used.

- 10 \newif\ifunit@@xspace
- 11 \unit@@xspacetrue

\ifunit@@xspace

This switch decides whether abbreviattions are loaded.

- 12 \newif\ifunit@@useabbrv
- 13 \unit@@useabbrvtrue

The follwing switches decide whether to load a .cfg file containing some abbreviations or not.

- 14 \newif\ifunit@@useampabbrv
- 15 \unit@@useampabbrvtrue
- 16 \newif\ifunit@@usefreqabbrv
- 17 \unit@@usefreqabbrvtrue
- 18 \newif\ifunit@@usemolabbrv
- 19 \unit@@usemolabbrvtrue
- 20 \newif\ifunit@@usevoltabbrv
- 21 \unit@@usevoltabbrvtrue
- 22 \newif\ifunit@@usevolabbrv
- 23 \unit@@usevolabbrvtrue
- 24 \newif\ifunit@@useweightabbrv
- 25 \unit@@useweightabbrvtrue
- 26 \newif\ifunit@@useenergyabbrv
- 27 \unit@@useenergyabbrvtrue
- 28 \newif\ifunit@@uselengthabbrv
- $29 \ \verb|\unit@@uselengthabbrvtrue|$
- 30 \newif\ifunit@@usetimeabbrv
- 31 \unit@@usetimeabbrvtrue

\ifunit@@useconfigfile This switch stores whether the option noconfig is given.

```
32 \newif\ifunit@@useconfigfile
33 \unit@@useconfigfiletrue
```

9.2 Options

```
34 \DeclareOption{OHM}{\unit@@Ohmtrue}
35 \DeclareOption{ohm}{\unit@@Ohmfalse}
36 \DeclareOption{redef-gensymb}{%
          \@ifpackageloaded{gensymb}{%
37
               \unit@@redefgensymbtrue%
38
               \AtBeginDocument{%
39
                   \let\gensymbohm\ohm%
40
                   \let\gensymbcelsius\celsius%
41
42
                   \let\gensymbmicro\micro%
43
                   \renewunit{\ohm}{\unitOmega}%
                   \renewunit{\celsius}{\unitCelsius}%
44
                   \renewcommand{\micro}{\unitmu\@@setunitsepfalse}%
45
              }
46
         }{%
47
               \PackageError{unitsdef}{
48
                   You requestet me to save some macros from the \MessageBreak
49
                   gensymb-package. This package is not loaded.\MessageBreak
50
                   If you load it later, tell me to use uppercase\MessageBreak
51
                   macronames where conflicts appear by giving me\MessageBreak
52
53
                   the option OHM.
              }
54
         }
55
56 }
57 \DeclareOption{liter}{\unit@@litertrue}
58 \DeclareOption{LITER}{\unit@@literfalse}
59 \DeclareOption{noxspace}{\unit@@xspacefalse}
60 \DeclareOption{noabbrv}{\unit@@useabbrvfalse}
61 \DeclareOption{ugly}{\PassOptionsToPackage{ugly}{units}}
62 \DeclareOption{noamperageabbr}{\unit@@useampabbrvfalse}
63 \DeclareOption{nofrequncyabbr}{\unit@@usefreqabbrvfalse}
64 \DeclareOption{nomolabbr}{\unit@@usemolabbrvfalse}
65 \DeclareOption{novoltageabbr}{\unit@@usevoltabbrvfalse}
66 \label{lem:condition} Goal and the condition of the 
67 \verb|\DeclareOption{noweightabbr}{\unit@@useweightabbrvfalse}|
68 \DeclareOption{noenergyabbr}{\unit@@useenergyabbrvfalse}
69 \DeclareOption{nolengthabbr}{\unit@@uselengthabbrvfalse}
70 \DeclareOption{notimeabbr}{\unit@@usetimeabbrvfalse}
71 \DeclareOption{noconfig}{\unit@@useconfigfilefalse}
```

72 \ProcessOptions

9.3 Loading packages

- 73 \RequirePackage[T1]{fontenc}
- $74 \RequirePackage{amsmath}$
- 75 \RequirePackage{textcomp}
- $76 \RequirePackage{units}$
- 77 \ifunit@@xspace
- 78 \RequirePackage{xspace}%
- 79 \let\unit@@xspace\xspace%
- $80 \ensuremath{\setminus} \texttt{else}$
- 81 \let\unit@@xspace\relax
- 82\fi

9.4 The interface

\unitsignonly

This macro is used to typeset a unit without leading spacing. To achieve this $\ensuremath{\verb|Q@setunitsep|}$ is set to false. $\ensuremath{\verb|unitsignonly|}$ has an mandatory argument containing the unit to typeset: $\ensuremath{\verb|unitsignonly|}$.

- 83 \DeclareRobustCommand{\unitsignonly}[1]{%
- 84 \@@setunitsepfalse%
- 85 \begingroup%
- 86 \let\unit@@xspace\relax%
- 87 #1%
- 88 \endgroup}

\unitvaluesep

This Macro specifies the distance between value and unit, default value is \,.

- 89 \newcommand{\unitvaluesep}{}
- 90 \let\unitvaluesep\,%

\newunit This macro is the interface to define new units. Usage is:

```
\mbox{\ensuremath{\mbox{newunit}}} {\ensuremath{\mbox{\mbox{\mbox{}}}}} {\ensuremath{\mbox{\mbox{\mbox{}}}}} {\ensuremath{\mbox{\mbox{\mbox{}}}}} {\ensuremath{\mbox{\mbox{\mbox{}}}}}.
```

91 \newcommand{\newunit}[2]{%

First there is a check whether the macro already exists:

192 \newcommand{#1}{}%

then its definition is performed.

93 \DeclareRobustCommand{#1}[1][]{##1%

The redefinition of \unitvaluesep has to stay local:

94 \begingroup%

\mathbb{xpsace} must not do anything when invoked inside a unit. So it is set to \mathbb{relax} inside this group.

```
95 \let\unit@@xspace\relax%
96 \if@@setunitsep%
97 \unitvaluesep%
```

Once a spacing is typeset there must no further spacing be typeset. To avoid typesetting more spacings I redefine \unitvaluesep to \relax.

```
98 \let\unitvaluesep\relax%

99 \fi%

100 \unit{#2}\global\@@setunitseptrue%

101 \endgroup%
```

Now \xspace has to be invoked, as long as noxspace is not set.

```
102 \unit@@xspace%
103 }%
104 }
```

\renewunit This macro is to redifine existing units.

```
105 \newcommand{\renewunit}[2]{%
        \renewcommand{#1}{}%
106
        \DeclareRobustCommand{#1}[1][]{##1%
107
          \begingroup%
108
           \let\unit@@xspace\relax%
109
110
           \if@@setunitsep%
             \unitvaluesep%
111
             \left\langle \right\rangle ,\
112
113
114
           \unit{#2}\global\@@setunitseptrue%
115
          \endgroup%
          \unit@@xspace%
116
        }%
117
118 }
119
```

\newnosepunit

```
120 \newcommand{\newnosepunit}[2]{%
121 \newcommand{#1}{}%
122 \DeclareRobustCommand{#1}[1][]{##1%
123 \begingroup%
124 \let\xspace\relax%
125 \if@@setunitsep%
126 \let\,\relax%
127 \fi%
```

```
128
                             \unit{#2}\global\@@setunitseptrue%
                  129
                            \endgroup%
                            \unit@@xspace%
                  130
                          }%
                  131
                  132 }
                  133 \newcommand{\renewnosepunit}[2]{%
                          \renewcommand{#1}{}%
                          \DeclareRobustCommand{#1}[1][]{##1%
                  135
                            \begingroup%
                  136
                             \let\unit@@xspace\relax%
                  137
                             \if@@setunitsep%
                  138
                               \left\langle \right\rangle \
                  139
                             \fi%
                  140
                  141
                             \verb|\unit{#2}\global@@setunitseptrue||
                  142
                            \endgroup%
                  143
                            \unit@@xspace%
                  144
                  145 }
             \per
                  146 \newcommand\per[2]{%
                        \@@setunitsepfalse%
                        \unitfrac{#1}{#2}%
                  149 }
             \ilu The command \ilu provides the possibility to typeset inline-units that are not
                   defined by a previous \newunit command.
                  150 \newcommand{\ilu}[2][]{%
                       \begingroup%
                  151
                          \@@setunitsepfalse%
                  152
                          \let\unit@@xspace\relax%
                  153
                          #1\,\unit{#2}%
                  154
                  155
                        \endgroup%
                  156 }
      \unittimes
                  157 \end{\text{\cdot}} \label{lem:cdot} $$157 \end{\text{\cdot}} $$
        \unitsep
                  158 \let\unitsep\,
\unitsuperscript
                  159 \newcommand{\unitsuperscript}[1]{%
                       \ifmmode^{#1}\else\textsuperscript{#1}\fi%
                  161 }
```

```
\unitMathOmega
                                                                162 \mbox{ } \mbox{newcommand{\unitMathOmega}{}}
        \unitTextOmega
                                                                163 \newcommand{\unitTextOmega}{}
                  \unittextmu
                                                                164 \mbox{\lower} \mbox{\low
                   \unitmathmu
                                                                165 \newcommand{\unitMathmu}{}
\unitMathCelsius
                                                                166 \newcommand{\unitMathCelsius}{}
\unitTextCelsius
                                                                167 \newcommand{\unitTextCelsius}{}
    \unitTextDegree
                                                                168 \newcommand{\unitTextDegree}{}
    \unitMathDegree
                                                                169 \newcommand{\unitMathDegree}{}
               \unitCelsius
                                                                170 \newcommand{\unitCelsius}{%
                                                                171 \ifmmode\unitMathCelsius\else\unitTextCelsius\fi%
                                                                172 }
                                 \unitmu
                                                                173 \newcommand{\unitmu}{%
                                                                174 \ifmmode\unitMathmu\else\unitTextmu\fi%
                                                                175 }
                       \unit0mega
                                                                176 \newcommand{\unitOmega}{%
                                                                177 \ifmmode\unitMathOmega\else\unitTextOmega\fi%
                                                                178 }
                  \unitDegree
                                                                179 \newcommand{\unitDegree}{%
                                                                180 \ifmmode\unitMathDegree\else\unitTextDegree\fi%
                                                                181 }
```

```
\setMathOmega
                 182 \newcommand{\setMathOmega}[1]{%
                 183 \renewcommand{\unitMathOmega}{\text{#1}}%
                 184 }
                 185 \setMathOmega{$\mathrm{\Omega}$}
     \setMathmu
                 186 \newcommand{\setMathmu}[1]{%
                      \renewcommand{\unitMathmu}{\text{#1}}%
                 188 }
                 189 \st Mathmu{\texttextmu}
\setMathCelsius
                 190 \newcommand{\setMathCelsius}[1]{%
                      \renewcommand{\unitMathCelsius}{\text{#1}}%
                 192 }
                 193 \setMathCelsius{\textcelsius}
 \setMathDegree
                 194 \newcommand{\setMathDegree}[1]{%
                      \renewcommand{\unitMathDegree}{\text{#1}}%
                 196 }
                 197 \setMathDegree{\textdegree}
                 This macro is to define the \Omega that is used in text mode. The first argument
                 is used when \rmfamily is active, the latter when \sffamily is active.
                 198 \newcommand{\setTextOmega}[2]{%
                      \renewcommand{\unitTextOmega}{%
                 199
                        \begingroup%
                 200
                 201
                          \edef\@tempa{\sfdefault}%
                 202
                          \ifx\f@family\@tempa%
                 203
                            #2%
                 204
                          \else%
                            #1%
                 205
                          \fi%
                 206
                        \endgroup%
                 207
                 208
                      ጉ%
                 209 }
                 210 \setTextOmega{\textohm}{\textohm}
     \setTextmu This macro is to define the »µ« that is used in text mode. The first argument
                 is used when \rmfamily is active, the latter when \sffamily is active.
                 211 \newcommand{\setTextmu}[2]{%
```

```
212
     \renewcommand{\unitTextmu}{%
213
       \begingroup%
         \edef\@tempa{\sfdefault}%
214
         \ifx\f@family\@tempa%
215
216
217
          \else%
218
            #1%
          \fi%
219
220
        \endgroup%
     }%
221
222 }
223 \setTextmu{\textmu}{\textmu}
```

\setTextCelsius This macro is to define the »°C« that is used in text mode. The first argument is used when \rmfamily is active, the latter when \sffamily is active.

```
224 \newcommand{\setTextCelsius}[2]{%
                                                                                                                            \renewcommand{\unitTextCelsius}{%
   226
                                                                                                                                                                             \begingroup%
                                                                                                                                                                                                                          \ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ens
227
                                                                                                                                                                                                                          \footnote{Maines} $$  \ifx\footnote{Maines} $$ \cite{Maines} $$ if $x \in \mathbb{Z}_{\infty} $$ 
   228
   229
                                                                                                                                                                                                                                                                        #2%
                                                                                                                                                                                                                              \else%
   230
   231
                                                                                                                                                                                                                                                                        #1%
   232
                                                                                                                                                                                                                              \fi%
   233
                                                                                                                                                                                 \endgroup%
   234
   235 }
   236 \texttt{\textCelsius}{\texttt{\textcelsius}}{\texttt{\textcelsius}}
```

\setTextDegree

This macro is to define the »°« that is used in text mode. The first argument is used when \rmfamily is active, the latter when \sffamily is active.

```
237 \newcommand{\setTextDegree}[2]{%
238
     \renewcommand{\unitTextDegree}{%
239
       \begingroup%
240
         \edef\@tempa{\sfdefault}%
241
         \ifx\f@family\@tempa%
242
            #2%
          \else%
243
            #1%
244
         \fi%
245
       \endgroup%
246
247
     }%
248 }
249 \setTextDegree{\textdegree}{\textdegree}
```

\unitSIdef

250 \newcommand\unitSIdef{\upshape}

\SI

```
251 \newcommand{\SI}{}
252 \DeclareRobustCommand{\SI}[2]{%
253 \begingroup%
254 \let\unit@@xspace\relax%
255 \unitSIdef\selectfont%
256 #1#2%
257 \endgroup%
258 }
```

9.5 Definition of prefices

```
259 \newcommand{\yocto}{y\0@setunitsepfalse}
                                                                                                                                                                                                                                                                                                                                                                    % -24
 260 \newcommand{\zepto}{z\@@setunitsepfalse}
                                                                                                                                                                                                                                                                                                                                                                    % -21
 261 \newcommand{\atto}{a\@@setunitsepfalse}
                                                                                                                                                                                                                                                                                                                                                                    % -18
 262 \newcommand{\femto}{f\@@setunitsepfalse}
                                                                                                                                                                                                                                                                                                                                                                    % -15
 263 \newcommand{\pico}{p\@@setunitsepfalse}
                                                                                                                                                                                                                                                                                                                                                                     % -12
 264 \newcommand{\no}{n\command{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcommand{\newcomma
                                                                                                                                                                                                                                                                                                                                                                     % -9
 265 \ifunit@@Ohm
 266
                             \newcommand{\Micro}{\unitmu\@@setunitsepfalse}
 267
                            \let\@unit@micro\Micro
 268 \else
 269 \ifunit@@redefgensymb\else
 270
                                      \newcommand{\micro}{\unitmu\@@setunitsepfalse}
271
                           \let\@unit@micro\micro
 272 \fi
 273 \fi
 274 \newcommand{\milli}{m\@@setunitsepfalse}
                                                                                                                                                                                                                                                                                                                                                                     % -3
 275 \newcommand{\centi}{c\@@setunitsepfalse}
                                                                                                                                                                                                                                                                                                                                                                     % -2
 276 \mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath}\ensuremath{\mbox{\ensuremath{\mbox{\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensuremath}\ensur
                                                                                                                                                                                                                                                                                                                                                                     % -1
                                                                                                                                                                                                                                                                                                                                                                    % +1
 278 \mbox{\newcommand{\deca}{\da@esetunitsepfalse}}
 279 \newcommand{\hecto}{h\0@setunitsepfalse}
                                                                                                                                                                                                                                                                                                                                                                    % +2
 281 \newcommand{\kilo}{k\@@setunitsepfalse}
                                                                                                                                                                                                                                                                                                                                                                    % +3
 282 \newcommand{\mega}{M\@@setunitsepfalse}
                                                                                                                                                                                                                                                                                                                                                                    % +6
 283 \newcommand{\giga}{G\@@setunitsepfalse}
 284 \newcommand{\tera}{T\@@setunitsepfalse}
                                                                                                                                                                                                                                                                                                                                                                    % +12
 285 \newcommand{\peta}{P\@@setunitsepfalse}
                                                                                                                                                                                                                                                                                                                                                                    % +15
 286 \ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{\ensuremath{
                                                                                                                                                                                                                                                                                                                                                                    % +18
 287 \end{zetta} {\tt Z\@@setunitsepfalse}
                                                                                                                                                                                                                                                                                                                                                                    % +21
```

```
288 \newcommand{\yotta}{Y\@@setunitsepfalse}
289
```

% +24

9.6 Definitions of units

9.6.1 base units

```
290 \newunit{\meter}{m}
291 \newunit{\gram}{g}
292 \newunit{\kilogram}{\kilo\gram}
293 \newunit{\mole}{mol}
294 \newunit{\second}{s}
295 \newunit{\ampere}{A}
296 \newunit{\kelvin}{K}
297 \newunit{\candela}{cd}
```

9.6.2 Units of length

```
299
300 \newunit{\picometer}{\pico\meter}
301 \newunit{\nanometer}{\nano\meter}
302 \newunit{\micrometer}{\Qunit\Qmicro\meter}
303 \newunit{\millimeter}{\milli\meter}
304 \newunit{\centimeter}{\centi\meter}
305 \newunit{\decimeter}{\deci\meter}
306 \newunit{\kilometer}{\kilo\meter}
307
```

9.6.3 Units of weight

```
308
309 \newunit{\femtogram}{\femto\gram}
310 \newunit{\picogram}{\pico\gram}
311 \newunit{\nanogram}{\nano\gram}
312 \newunit{\microgram}{\Qunit\Qmicro\gram}
313 \newunit{\milligram}{\milli\gram}
```

9.6.4 Units of quantity

```
315
316 \newunit{\femtomole}{\femto\mole}
317 \newunit{\picomole}{\pico\mole}
318 \newunit{\nanomole}{\nano\mole}
319 \newunit{\micromole}{\Qunit\Qmicro\mole}
320 \newunit{\millimole}{\milli\mole}
321
```

9.6.5 Units of time

```
323
324 \newunit{\attosecond}{\atto\sek}
325 \newunit{\femtosecond}{\femto\sek}
326 \newunit{\picosecond}{\pico\sek}
327 \newunit{\nanosecond}{\nano\sek}
328 \newunit{\microsecond}{\dunitdmicro\sek}
329 \newunit{\millisecond}{\milli\sek}
330
331

9.6.6 amperage

332
333 \newunit{\picoampere}{\pico\ampere}
334 \newunit{\nanoampere}{\nano\ampere}
335 \newunit{\microampere}{\dunitdmicro\ampere}
336 \newunit{\milliampere}{\milli\ampere}
337 \newunit{\kiloampere}{\kilo\ampere}
338

9.6.7 Percent
```

339 340 \newunit{\percent}{\%}

9.6.8 Volumes

```
343 \ifunit@@liter
344 \ \mbox{newunit{\liter}{1}}
345 \ensuremath{\setminus} \texttt{else}
     \newunit{\liter}{L}
346
347 \ \texttt{fi}
348
349 \mbox{ } {\mathbf femtoliter} {\mathbf ter}
350 \newunit{\picoliter}{\pico\liter}
351 \newunit{\nanoliter}{\nano\liter}
352 \newunit{\microliter}{\@unit@micro\liter}
353 \newunit{\milliliter}{\milli\liter}
354 \end{(centiliter)} {\bf (centiliter)}
355 \newunit{\deciliter}{\deci\liter}
356 \newunit{\hectoliter}{\hecto\liter}
357
```

```
358 \newunit{\cubicmeter}{\meter\unitsuperscript{3}}
 359 \newunit{\cubicmicrometer}{\micrometer\unitsuperscript{3}}
 360 \newunit{\cubicmillimeter}{\millimeter\unitsuperscript{3}}
 361
 362
      9.6.9 Areas
 364 \newunit{\squaremeter}{\meter\unitsuperscript{2}}
 366 \left\{ \sum_{a} a \right\}
 367 \mbox{ \newunit{\hektar}{\hecto\ar}}
 369 \verb|\newunit{\squarecentimeter}{\centimeter\unitsuperscript{2}}|
 370 \mbox{ \colored} {\bf \colo
 371 \ensuremath{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\colored{\co
      9.6.10 more units of weight
 373 \neq \{t\}
      9.6.11 Derived electrical units
 376 \newunit{\volt}{V}
 377 \mbox{\mbox{$\mbox{$\mbox{millivolt}}{\mbox{$\mbox{$\mbox{$\mbox{$\mbox{$\mbox{$\mbox{$\mbox{$\mbox{$\mbox{$}\mbox{$\mbox{$}\mbox{$\mbox{$}\mbox{$\mbox{$}\mbox{$}\mbox{$}\mbox{$\mbox{$}\mbox{$}\mbox{$}\mbox{$\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\mbox{$}\
379 \newunit{\kilovolt}{\kilo\volt}
380
381 \newunit{\watt}{W}
382 \newunit{\milliwatt}{\milli\watt}
383 \newunit{\kilowatt}{\kilo\watt}
 384 \newunit{\megawatt}{\mega\watt}
 386 \newunit{\coulomb}{C}
     Don't forget the options when typesetting \Omega!
 387 \  \  
 388 \newunit{\Ohm}{\unitOmega}
 389
                                  \newunit{\kiloohm}{\kilo\Ohm}
 390
                                   \newunit{\megaohm}{\mega\Ohm}
 391
                                 \newunit{\gigaohm}{\giga\0hm}
 392 \ensuremath{\setminus} \texttt{else}
                                  \ifunit@@redefgensymb\else
 394
                                                 \newunit{\ohm}{\unitOmega}
```

```
395
    \fi
     \newunit{\kiloohm}{\kilo\ohm}
396
397
     \newunit{\megaohm}{\mega\ohm}
398
     \newunit{\gigaohm}{\giga\ohm}
400 \newunit{\siemens}{S}
401 \newunit{\millisiemens}{\milli\siemens}
402 \neq \{farad\} \{F\}
403 \neq 103 \neq 100
404 \neq 104 \neq 100
405 \newunit{\nanofarad}{\nano{farad}}
406 \neq 06 
407 \newunit{\millifarad}{\milli\farad}
9.6.12 Units of energy
408 \newunit{\joule}{J}
409 \newunit{\millijoule}{\milli\joule}
410 \newunit{\kilojoule}{\kilo\joule}
411 \newunit{\megajoule}{\mega\joule}
413 \verb|\newunit{\calory}{cal}|
414 \newunit{\kilocalory}{\kilo\calory}
415 \newunit{\electronvolt}{eV}
416 \newunit{\millielectronvolt}{\milli\eV}
417 \newunit{\kiloelectronvolt}{\kilo\eV}
418 \newunit{\megaelectronvolt}{\mega\eV}
419 \newunit{\gigaelectronvolt}{\giga\eV}
420 \newunit{	ext{teraelectronvolt}{	ext{vera}}
9.6.13 more units of time
422 \newunit{\minute}{min}
423 \neq \{h\}
424 \neq \{days}{d}
9.6.14 more units of temperature
Don't forget gensymb when typesetting degree Celsius.
425 \ifunit@@Ohm
    \newunit{\Celsius}{\unitCelsius}
427 \ensuremath{\setminus} \text{else}
    \ifunit@@redefgensymb\else
       \newunit{\celsius}{\unitCelsius}
430 \fi
```

431 \fi

9.6.15 Angles and arcs

```
432 \neq \{radian} 
433 \neq \{sr}
434 \ifunit@@Ohm
     \newnosepunit{\Degree}{\unitDegree}
436 \else
     \ifunit@@redefgensymb\else
437
       \newnosepunit{\degree}{\unitDegree}
438
     \fi
440 \fi
442 \newunit{\arcmin}{\ensuremath{{}^{prime}}}
443 \mbox{\ensuremath{{}^{\rm prime}}}
Some TeX to realize the syntax using; as separator.
444 \ensuremath{\arc}[1] {\tt expandafter\unit@arc#1;;!}
445
446 \def\unit@arc#1;#2;#3!{%
      \ifx\\#1\\\def\unit@arcdegreevalue{0}%
447
      \else\def\unit@arcdegreevalue{#1}\fi%
448
449
      \ifx\\#2\\\def\unit@arcminvalue{0}%
      \else\def\unit@arcminvalue{#2}\fi%
      \int \frac{\pi}{\pi} \left( \frac{0}{\pi} \right) def \int \frac{1}{\pi} dx
452
      \else\edef\unit@arcsecvalue{\expandafter\unit@strip#3;!}\fi%
453
      \begingroup%
        \let\unit@@xspace\relax%
454
        \ifnum\unit@arcsecvalue=0\relax%
455
          \ifnum\unit@arcminvalue=0\relax%
456
            \ifnum\unit@arcdegreevalue=0\relax\else%
457
              \unit@arcdegreevalue\degree%
458
            \fi%
459
460
          \else%
            \unit@arcdegreevalue\degree%
461
462
            \unitvaluesep%
463
            \unit@arcminvalue\arcmin%
464
          \fi%
465
        \else%
          \unit@arcdegreevalue\degree%
466
          \unitvaluesep%
467
          \unit@arcminvalue\arcmin%
468
469
          \unitvaluesep%
          \unit@arcsecvalue\arcsec%
470
471
        \fi%
472
      \endgroup%
```

```
473 }
474
475 \def\unit@strip#1;#2!{%
    \ifx\1\\0\else#1\fi%
477 }
478
9.6.16 Frequencies
479 \newunit{\hertz}{Hz}
    \newunit{\kilohertz}{\kilo\hertz}
481
     \newunit{\megahertz}{\mega\hertz}
482
     \newunit{\gigahertz}{\giga\hertz}
9.6.17 Force
484 \neq \{N\}
    \newunit{\millinewton}{\milli\newton}
    \newunit{\kilonewton}{\kilo\newton}
9.6.18 Pressure
487 \neq \{Pa\}
488 \newunit{\hectopascal}{\hecto\pascal}
489 \neq \{uBar}{bar}
    \newunit{\millibar}{\milli\uBar}
9.6.19 magnetic field strength
491 \neq \{0\}
9.6.20 magnetic flux density
492 \neq \{T\}
9.6.21 Induction
493 \newunit{\henry}{H}
9.6.22 Lumen
494 \neq \{\lim \{1m\}\}
9.6.23 Illuminance
495 \left\{ \sum_{x} {1x} \right\}
9.6.24 Radioactivity
496 \newunit{\becquerel}{Bq}
    \newunit{\megabecquerel}{\mega\becquerel}
498 \neq \{Cu\}
```

9.6.25 Sievert

```
499 \newunit{\sievert}{Sv}
500 \newunit{\millisievert}{\milli\sievert}
```

9.7 Loading abbreviations

Now the abbreviations are loaded if no option is specified to withhold some abbreviations.

```
501 \ifunit@@useabbrv
     \ifunit@@useampabbrv
        \InputIfFileExists{ampabbrv.cfg}%
503
504
          {\PackageInfo{unitsdef}{Abbreviations for units of amperage loaded.}}%
505
          {\PackageWarning{unitsdef}{ampabbrv.cfg not found!}}%
     \fi
506
     \ifunit@@usefreqabbrv
507
        \InputIfFileExists{freqabbr.cfg}%
508
          {\PackageInfo{unitsdef}{Abbreviations for units of frequency loaded.}}%
509
          {\PackageWarning{unitsdef}{freqabbr.cfg not found!}}%
510
511
     \ifunit@@usemolabbrv
512
        \InputIfFileExists{molabbrv.cfg}%
513
          {\PackageInfo{unitsdef}{Abbreviations for units of amount of substances loaded.}}%
514
515
          {\PackageWarning{unitsdef}{molabbrv.cfg not found!}}%
516
     \fi
     \ifunit@@usevoltabbrv
517
       \InputIfFileExists{voltabbr.cfg}%
518
         {\PackageInfo{unitsdef}{Abbreviations for units of voltage loaded.}}%
519
         {\PackageWarning{unitsdef}{voltabbr.cfg not found!}}%
520
     \fi
521
     \ifunit@@usevolabbrv
522
523
       \InputIfFileExists{volabbrv.cfg}%
524
         {\PackageInfo{unitsdef}{Abbreviations for units of volume loaded.}}%
525
         {\PackageWarning{unitsdef}{volabbrv.cfg not found!}}%
526
     \fi
     \ifunit@@useweightabbrv
527
       \InputIfFileExists{weigabbr.cfg}%
528
         {\PackageInfo{unitsdef}{Abbreviations for units of weight loaded.}}%
529
         {\PackageWarning{unitsdef}{weigabbr.cfg not found!}}%
530
     \fi
531
     \ifunit@@useenergyabbrv
532
       \InputIfFileExists{enerabbr.cfg}%
533
         {\PackageInfo{unitsdef}{Abbreviations for units of energy loaded.}}%
534
         {\PackageWarning{unitsdef}{enerabbr.cfg not found!}}%
535
536
     \fi
```

```
\ifunit@@uselengthabbrv
537
       \InputIfFileExists{lengabbr.cfg}%
538
539
         {\PackageInfo{unitsdef}{Abbreviations for units of length loaded.}}%
         {\PackageWarning{unitsdef}{lengabbr.cfg not found!}}%
540
541
     \ifunit@@usetimeabbrv
542
543
       \InputIfFileExists{timeabbr.cfg}%
544
         {\PackageInfo{unitsdef}{Abbreviations for units of time loaded.}}%
         {\PackageWarning{unitsdef}{timeabbr.cfg not found!}}%
545
    \fi
546
547 \fi
\InputIfFileExists{unitsdef.cfg}%
550
       {\PackageInfo{unitsdef}{Local config file loaded.}}%
551
       {\PackageInfo{unitsdef}{No local config file found.}}%
552 \ensuremath{\setminus} else
553 \PackageInfo{unitsdef}{Local config file not loaded.}
554 \fi
555 %
556 \langle /package \rangle
```

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