

# The `dimnum` package

Miguel R. Clemente  
`miguel.clemente@dem.uc.pt`

v1.0.0 from 2021/04/01

Note: Prandtl number is redefined from the `amsmath` package.

## 1 Introduction

This package simplifies the calling of Dimensionless Numbers in math or text mode.

In Table 1 you can find all available Dimensionless Numbers.

## 2 Usage

A Dimensionless number is composed of four items:

- the command,
- the symbol,
- the name,
- its identifier.

You can call a Dimensionless Number in three distinct ways:

- by its symbol – using the command (i.e. `\Ar` – Ar).
- by its name (short version) – appending [s] to the command (i.e. `\Bi[s]` – Biot).
- by its name and identifier (long version) – appending [l] to the command (i.e. `\Kn[l]` – Knudsen number).

Symbol, short and long versions, all work in math or text mode without the need of further commands.

Besides the comprehensive list of included Dimensionless Numbers, this package also introduces a command to create new Dimensionless Numbers. Creating a Dimensionless Number is achieved by using

```
\newdimnum{\command}{symbol}{name}{identifier}
```

for example, to add the Morton number we write

```
\newdimnum{\Mo}{Mo}{Morton}{number}
```

The identifier can be left empty, such as in the case of Drag Coefficient

```
\newdimnum{Cd}{\ensuremath{C_d}}{Drag Coefficient}{}
```

in this example we also introduce an important command. When the Dimensionless Number symbol is always expressed in math mode – either by definition or the use of subscripts or superscripts – we add `\ensuremath{}` to encompass the symbol, ensuring a proper representation of the Dimensionless Number.

You can add your own Dimensionless Numbers to your projects. Requests and suggestions to increment Table 1 are accepted and encouraged.

Table 1: List of Dimensionless Numbers Available

Long Name	Symbol	Command	Application Fields
Archimedes number	Ar	<code>\Ar</code>	Fluid Mechanics
Atwood number	A	<code>\At</code>	Fluid Mechanics
Bagnold number	Ba	<code>\Ba</code>	Geology, Fluid Mechanics
Bejan number	Be	<code>\Be</code>	Fluid Mechanics, Thermodynamics
Bingham number	Bm	<code>\Bm</code>	Fluid Mechanics, Rheology
Biot number	Bi	<code>\Bi</code>	Heat Transfer, Mass Transfer
Blake number	Bl	<code>\Bl</code>	Geology, Fluid Mechanics, Porous Media
Bodenstein number	Bs	<code>\Bs</code>	Chemistry, Geology, Fluid Mechanics
Bond number	Bo	<code>\Bo</code>	Mechanics, Porous Media
Brinkman number	Br	<code>\Br</code>	Fluid Mechanics, Heat Transfer
Brownell-Katz number	$N_{BK}$	<code>\Bk</code>	Fluid Mechanics
Capillary number	Ca	<code>\Cap</code>	Fluid Mechanics, Porous Media
Cauchy number	C	<code>\Cau</code>	
Chandrasekhar number	Q	<code>\Ch</code>	Magnetohydrodynamics
Coefficient of Friction	$C_f$	<code>\Cf</code>	
Condensation number	Co	<code>\Co</code>	
Dahmköhler number	Da	<code>\Dah</code>	Chemistry
Darcy number	Da	<code>\Dar</code>	Porous Media

Continues on the next page

Table 1 – continued from the previous page

Long Name	Symbol	Command	Application Fields
Dean number	De	\De	Fluid Mechanics
Deborah number	De	\Deb	Rheology
Drag Coefficient	$C_d$	\Cd	
Dukhin number	Du	\Du	Colloid Science
Eckert number	Ec	\Ec	Heat Transfer
Ekman number	Ek	\Ek	Geophysics
Elasticity number	El	\Ela	
Elenbass number	El	\El	
Eötvös number	Eo	\Eo	Fluid Mechanics
Ericksen number	Er	\Er	Fluid Dynamics
Euler number	Eu	\Eu	Hydrodynamics
Fourier number	Fo	\Fo	Heat Transfer, Mass Transfer
Froude number	Fr	\Fr	Fluid Mechanics
Galilei number	Ga	\Ga	Fluid Mechanics
Görtier number	G	\Go	Fluid Dynamics
Graetz number	Gz	\Gz	Fluid Mechanics, Heat Transfer
Grashof number	Gr	\Gr	Heat Transfer
Hatta number	Ha	\Ha	Chemistry
Hagen number	Hg	\Hg	Heat Transfer
Hodgson number	H	\Ho	
Iribarren number	Ir	\Ir	Wave Mechanics
Jakob number	Ja	\Ja	Chemistry
Karlovitz number	Ka	\Ka	Combustion
Keulegan-Carpenter number	$K_C$	\Kc	Fluid Dynamics
Knudsen number	Kn	\Kn	Gas Dynamics
Kutateladze number	Ku	\Ku	Fluid Mechanics
Laplace number	La	\La	Fluid Dynamics
Lewis number	Le	\Le	Heat Transfer, Mass Transfer
Mach number	Ma	\Ma	Gas Dynamics
Marangoni number	Mg	\Mg	Fluid Mechanics
Morton number	Mo	\Mo	Fluid Dynamics
Nusselt number	Nu	\Nus	Heat Transfer
Ohnesorge number	Oh	\Oh	Fluid Dynamics
Péclet number	Pe	\Pe	Heat Transfer
pH	pH	\pH	Chemistry
Prandtl number	Pr	\Pr	Heat Transfer
Rayleigh number	Ra	\Ra	Heat Transfer
Reynolds number	Re	\Rey	Fluid Mechanics
Richardson number	Ri	\Ri	Fluid Dynamics
Roshko number	Ro	\Ro	Fluid Dynamics

Continues on the next page

Table 1 – continued from the previous page

Long Name	Symbol	Command	Application Fields
Rossby number	Ro	<code>\Ros</code>	Geophysics
Rouse number	P	<code>\Rou</code>	Sediment Transport
Schmidt number	Sc	<code>\Sc</code>	Mass Transfer
Sherwood number	Sh	<code>\Sh</code>	Mass Transfer
Sommerfeld number	S	<code>\So</code>	Hydrodynamic
Stanton number	St	<code>\St</code>	Lubrication Fluid Dynamics, Mass Transfer
Stefan number	Ste	<code>\Ste</code>	Thermodynamics
Stokes number	Stk	<code>\Stk</code>	Particles Suspensions
Strouhal number	Sr	<code>\Sr</code>	Fluid Dynamics
Stuart number	N	<code>\Stu</code>	Magnetohydrodynamics
Svelteness	Sv	<code>\Sv</code>	Design
Taylor number	Ta	<code>\Ta</code>	Fluid Dynamics
Ursell number	U	<code>\Ur</code>	Wave Mechanics
Vadasz number	Va	<code>\Va</code>	Porous Media
Wagner number	Wa	<code>\Wa</code>	Electrochemistry
Weaver flame speed number	Wea	<code>\Wea</code>	Combustion
Weber number	We	<code>\We</code>	Multiphase Flow
Weissenberg number	Wi	<code>\Wei</code>	Viscoelastic Flows

### 3 Implementation

```

1 \NeedsTeXFormat{LaTeX2e}
2 \ProvidesPackage{dimnum}
3 [2021/04/01 v1.0.0 Provides commands for Dimensionless numbers]
4 \RequirePackage{amsmath}
5 \RequirePackage{xifthen}
6 \let\Pr\relax
7 \newif\ifstartedinmathmode

\newdimnum

8 \newcommand{\newdimnum}[4]{%
9 \expandafter\newcommand\csname #1\endcsname[1][ ]{%
10 \ifthenelse{\equal{##1}{}}{%
11 \relax\ifmode\startedinmathmodetrue\else\startedinmathmodefalse\fi%
12 \ifstartedinmathmode\operatorname{#2}\else#2\fi}{%
13 \ifthenelse{\equal{##1}{s}}{\text{#3}}{%
14 \ifthenelse{\equal{##1}{l}}{%
15 \ifthenelse{\equal{#4}{}}{\text{#3}}{\text{#3 #4}}}{%
16 \ifthenelse{\equal{#4}{}}{\text{#3}}{\text{#3 #4}}}%
17 }%
18 }%
19 }%
20 }
```

21 \newdimnum{Ar}{Ar}{Archimedes}{number}  
 22 \newdimnum{At}{A}{Atwood}{number}  
 23 \newdimnum{Ba}{Ba}{Bagnold}{number}  
 24 \newdimnum{Be}{Be}{Bejan}{number}  
 25 \newdimnum{Bm}{Bm}{Bingham}{number}  
 26 \newdimnum{Bi}{Bi}{Biot}{number}  
 27 \newdimnum{Bl}{Bl}{Blake}{number}  
 28 \newdimnum{Bs}{Bs}{Bodenstein}{number}  
 29 \newdimnum{Bo}{Bo}{Bond}{number}  
 30 \newdimnum{Br}{Br}{Brinkman}{number}  
 31 \newdimnum{Bk}{\ensuremath{N\_{BK}}}{Brownell-Katz}{number}  
 32 \newdimnum{Cap}{Ca}{Capillary}{number}  
 33 \newdimnum{Cau}{C}{Cauchy}{number}  
 34 \newdimnum{Ch}{Q}{Chandrasekhar}{number}  
 35 \newdimnum{Cf}{\ensuremath{C\_f}}{Coefficient of Friction}{number}  
 36 \newdimnum{Co}{Co}{Condensation}{number}  
 37 \newdimnum{Dah}{Da}{Dahmköehler}{number}  
 38 \newdimnum{Dar}{Da}{Darcy}{number}  
 39 \newdimnum{De}{De}{Dean}{number}  
 40 \newdimnum{Deb}{De}{Deborah}{number}  
 41 \newdimnum{Cd}{\ensuremath{C\_d}}{Drag Coefficient}{number}  
 42 \newdimnum{Du}{Du}{Dukhin}{number}  
 43 \newdimnum{Ec}{Ec}{Eckert}{number}  
 44 \newdimnum{Ek}{Ek}{Ekman}{number}  
 45 \newdimnum{Ela}{El}{Elasticity}{number}  
 46 \newdimnum{El}{El}{Elenbass}{number}  
 47 \newdimnum{Eo}{Eo}{Eötvös}{number}  
 48 \newdimnum{Er}{Er}{Ericksen}{number}  
 49 \newdimnum{Eu}{Eu}{Euler}{number}  
 50 \newdimnum{Fo}{Fo}{Fourier}{number}  
 51 \newdimnum{Fr}{Fr}{Froude}{number}  
 52 \newdimnum{Ga}{Ga}{Galilei}{number}  
 53 \newdimnum{Go}{G}{Görtler}{number}  
 54 \newdimnum{Gz}{Gz}{Graetz}{number}  
 55 \newdimnum{Gr}{Gr}{Grashof}{number}  
 56 \newdimnum{Ha}{Ha}{Hatta}{number}  
 57 \newdimnum{Hg}{Hg}{Hagen}{number}  
 58 \newdimnum{Ho}{H}{Hodgson}{number}  
 59 \newdimnum{Ir}{Ir}{Iribarren}{number}  
 60 \newdimnum{Ja}{Ja}{Jakob}{number}  
 61 \newdimnum{Ka}{Ka}{Karlovitz}{number}  
 62 \newdimnum{Kc}{\ensuremath{K\_C}}{Keulegan-Carpenter}{number}  
 63 \newdimnum{Kn}{Kn}{Knudsen}{number}  
 64 \newdimnum{Ku}{Ku}{Kutateladze}{number}  
 65 \newdimnum{La}{La}{Laplace}{number}  
 66 \newdimnum{Le}{Le}{Lewis}{number}  
 67 \newdimnum{Ma}{Ma}{Mach}{number}  
 68 \newdimnum{Mg}{Mg}{Marangoni}{number}  
 69 \newdimnum{Mo}{Mo}{Morton}{number}  
 70 \newdimnum{Nus}{Nu}{Nusselt}{number}

```

71 \newdimnum{Oh}{Oh}{Ohnesorge}{number}
72 \newdimnum{Pe}{Pe}{Péclet}{number}
73 \newdimnum{pH}{pH}{pH}{ }
74 \newdimnum{Po}{Po}{Poiseuille}{constant}
75 \newdimnum{Pr}{Pr}{Prandtl}{number}
76 \newdimnum{Ra}{Ra}{Rayleigh}{number}
77 \newdimnum{Rey}{Re}{Reynolds}{number}
78 \newdimnum{Ri}{Ri}{Richardson}{number}
79 \newdimnum{Ro}{Ro}{Roshko}{number}
80 \newdimnum{Ros}{Ro}{Rossby}{number}
81 \newdimnum{Rou}{P}{Rouse}{number}
82 \newdimnum{Sc}{Sc}{Schmidt}{number}
83 \newdimnum{Sh}{Sh}{Sherwood}{number}
84 \newdimnum{So}{S}{Sommerfield}{number}
85 \newdimnum{St}{St}{Stanton}{number}
86 \newdimnum{Ste}{Ste}{Stefan}{number}
87 \newdimnum{Stk}{Stk}{Stokes}{number}
88 \newdimnum{Sr}{Sr}{Strouhal}{number}
89 \newdimnum{Stu}{N}{Stuart}{number}
90 \newdimnum{Sv}{Sv}{Svelteness}{ }
91 \newdimnum{Ta}{Ta}{Taylor}{number}
92 \newdimnum{Ur}{U}{Ursell}{number}
93 \newdimnum{Va}{Va}{Vadasz}{number}
94 \newdimnum{Wa}{Wa}{Wagner}{number}
95 \newdimnum{Wea}{Wea}{Weaver flame speed}{number}
96 \newdimnum{We}{We}{Weber}{number}
97 \newdimnum{Wei}{Wi}{Weissenberg}{number}
98 \endinput

```