# The **fontscale** package

A user interface for setting document font sizes

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## 1. Introduction

### 1.1. About

The fontscale package provides the following functionalities:

- Set font sizes via a classic, modular, or musical typographic scale.
- Set arbitrary sizes and baselineskips for the standard font size commands `\tiny`, `\scriptsize`, `\footnotesize`, `\small`, `\normalsize`, `\large`, `\Large`, `\LARGE`, `\huge`, and `\Huge`.
- Set the font size settings mid-document or within a local group.
- Set the font size by setting the font step, scale, or size.
- Set the font size relative to the current font size.
- Use the current font step, scale, size, and baselineskip directly, for example, for printing or within calculations.
- Print sample text to test different font sizes.
- For advanced users, store the step, scale, size, and baselineskip of each font size command in expl3 variables.

### 1.2. Loading the package

This package requires the 10 October 2023 l3kernel update. You may need to ensure that your LaTeX installation is up-to-date before using this package.

This package lets the user set arbitrary font sizes. This works with most fonts produced today, but, for historical reasons, the default Computer Modern font is available only in a number of fixed sizes. If you get a warning that Computer Modern is not available in the requested size, you may need to add the code `\RequirePackage{fix-cm}` before `\documentclass` to make Computer Modern available at arbitrary font sizes.

```
\usepackage{fontscale}
\fontscalesetup{⟨keyval list⟩}
```

Load the fontscale package via the usual command in the document preamble. This package has no package options. Instead, the package keys are set up via

the command \fontscalesetup{⟨keyval list⟩}. ⟨keyval list⟩ must receive a comma-separated list of keys and their associated values. The package keys are documented in §2 and §3.

Many LaTeX document classes have a font size option (10pt, 11pt, 12pt, etc.) which not only changes the set of document font sizes, but also modifies additional settings such as the page layout and vertical spacing which were specifically designed to work with those font sizes. For this reason, you may want to set the document class font size option close to the value of \normalsize set by this package.

Internally, this package sets up each font size command from \tiny to \Huge using the kernel command \@setfontsize — they have no additional functionality beyond that of \@setfontsize. Unlike the standard document classes, the font size commands set up by this package do not change the vertical spacing for displayed math and list structures. If the user would like to add this functionality or perhaps other features to the font size commands, they can do so via hooks, which are documented in the LaTeX kernel.

### 1.3. Terminology

When using the fontscale package, each font size, including the standard font size commands from \tiny to \Huge, has a step, scale, size, and baselineskip. The latter two parameters are the familiar first and second arguments to the low-level font command \fontsize{⟨dimen⟩}{⟨skip⟩}. The font scale is the relative font size; the ratio of the font size to \normalsize. The font step is the number of font size gradations from \normalsize, which has a step of 0. Table 1 lists the font step of each font size command.

This package defines many keys and commands that take as a value or argument a ⟨dim expr⟩, ⟨skip expr⟩, ⟨fp expr⟩, or ⟨int expr⟩. This syntax is short for a dimen, skip, floating point, or integer expression, respectively. See usrguide §5 for more information.[1]

## 2. Choosing the typographic scale

```
typographic-scale = classic-10pt, classic-11pt, classic-12pt,
modular, musical                              initial = classic-10pt
modular/ratio = ⟨fp expr⟩                            initial = 1.125
musical/ratio = ⟨fp expr⟩                               initial = 2
musical/notes = ⟨int expr⟩                              initial = 5
```

1. https://ctan.org/pkg/usrguide

Table 1: The step of each font size command. These are constants and cannot be changed.

| Command | Step |
|---------|------|
| \tiny | −4 |
| \scriptsize | −3 |
| \footnotesize | −2 |
| \small | −1 |
| \normalsize | 0 |
| \large | 1 |
| \Large | 2 |
| \LARGE | 3 |
| \huge | 4 |
| \Huge | 5 |

The key `typographic-scale` sets the font sizes using a classic, modular, or musical typographic scale. These are common methods of choosing a set of document font sizes. The choice of typographic scale initializes to `classic-10pt`.

The key `typographic-scale` can also be set in a condensed format via the keys `classic-10pt`, `classic-11pt`, `classic-12pt`, `modular`, or `musical`, which set the key `typographic-scale` to the corresponding value.

The classic typographic scale consists of the traditional font sizes 6, 7, 8, 9, 10, 11, 12, 14, 16, 18, 21, 24, 36, 48, 60, and 72.[2] They have been used since the sixteenth century and are the default font sizes on most computer software. The keys `classic-10pt, classic-11pt, classic-12pt` set the size of each font size command to values based on their position in the classic typographic scale. The size of \normalsize is the named point size. The sizes of the other font size commands are the adjacent font sizes in the scale. Table 2 lists the size of each font size command when using a classic typographic scale.

The key `modular` sets the font sizes from \tiny to \Huge using a modular typographic scale. In a modular scale, each font size is a fixed ratio from the

2. See §3.1 of *The Elements of Typographic Style* by Robert Bringhurst.

Table 2: The size of each font size command in pt when using a classic typographic scale.

| Command | classic-10pt | classic-11pt | classic-12pt |
|---|---|---|---|
| \tiny | 6 | 7 | 8 |
| \scriptsize | 7 | 8 | 9 |
| \footnotesize | 8 | 9 | 10 |
| \small | 9 | 10 | 11 |
| \normalsize | 10 | 11 | 12 |
| \large | 11 | 12 | 14 |
| \Large | 12 | 14 | 16 |
| \LARGE | 14 | 16 | 18 |
| \huge | 16 | 18 | 21 |
| \Huge | 18 | 21 | 24 |

adjacent font sizes.[3] Here, the base font size is the size of \normalsize, which can be set via the key normalsize/size = ⟨dim expr⟩, more documented in §3. If not set, \normalsize initializes to 10 pt. The modular ratio can be set via the key modular/ratio. The initial modular ratio is 1.125.

The key musical sets the font sizes according to their position in a musical typographic scale. The font size is calculated using the formula:[4]

$$f_i = f_0 \times r^{i/n}$$

$f_0$ is the base font size, the size of \normalsize. $f_i$ is the font size with font step $i$. $n$ is the number of notes in the musical scale—the number of font size gradations or steps above \normalsize. $r$ is the ratio of the musical scale, the ratio of the highest to the lowest note $f_n/f_0$. (The modular typographic scale is actually a special case of the musical typographic scale where $n = 1$.)

The musical ratio $r$ and the number of notes $n$ can be set via the keys musical/ratio and musical/notes. The initial musical ratio—2—and the initial number of notes—5—are the same as that of the classic typographic

3. https://alistapart.com/article/more-meaningful-typography/
4. I have referenced this article by Spencer Mortensen:
   https://spencermortensen.com/articles/typographic-scale/

Table 3: The size of each font size command when using a modular or musical typographic scale with the initial settings. The font sizes are in pt and rounded to two decimal places.

| Command | modular | musical |
|---|---|---|
| \tiny | 6.24 | 5.74 |
| \scriptsize | 7.02 | 6.60 |
| \footnotesize | 7.90 | 7.58 |
| \small | 8.89 | 8.71 |
| \normalsize | 10 | 10 |
| \large | 11.25 | 11.49 |
| \Large | 12.66 | 13.20 |
| \LARGE | 14.24 | 15.16 |
| \huge | 16.02 | 17.41 |
| \Huge | 18.02 | 20 |

scale.[5] Conveniently, \Huge is 5 steps above \normalsize. The font size of \normalsize $f_0$ can be set using the key normalsize/size = ⟨dim expr⟩, more documented in §3. When using a musical typographic scale, \normalsize initializes to 10 pt.[6]

baselineskip-size-ratio = ⟨fp expr⟩                    initial = 1.2

The key baselineskip-size-ratio sets the ratio of the font baselineskip to the font size. By default, the font baselineskip of each font size command equals its font size times ⟨fp expr⟩. Users should not set this key unless they really know what they are doing. When using increased line spacing, users should prefer the low-level font command \linespread or the setspace package.

## 3. Overwriting the typographic scale

In some situations, users may need to explicitly set the scale, size, or baselineskip of a font size command, overwriting the value set by the keys in

5. Ibid.
6. I have set the initial value to 10 pt instead of the 12 pt recommended by the Spencer Mortensen article because this matches the default settings of the standard LaTeX $2_\varepsilon$ document classes.

§2. Note that the font steps and the scale of `\normalsize` are constants and cannot be changed.

⟨font size command⟩`/scale` = ⟨fp expr⟩

The keys ⟨font size command⟩`/scale` set the scale of ⟨font size command⟩ to ⟨fp expr⟩, ignoring the value set by the key `typographic-scale`. The key `normalsize/scale` is not defined.

⟨font size command⟩`/size` = ⟨dim expr⟩

The keys ⟨font size command⟩`/size` set the size of ⟨font size command⟩ to ⟨dim expr⟩, ignoring the values set by the keys `typographic-scale` and ⟨font size command⟩`/scale`. ⟨dim expr⟩ supplies a default unit of pt.

The package will issue a warning if the user sets the keys ⟨font size command⟩`/size` and ⟨font size command⟩`/scale` for the same ⟨font size command⟩ since the latter key will be ignored.

⟨font size command⟩`/baselineskip` = ⟨skip expr⟩

The keys ⟨font size command⟩`/baselineskip` set the font baselineskip of ⟨font size command⟩ to ⟨skip expr⟩ instead of calculating it from the size of ⟨font size command⟩ and `baselineskip-size-ratio`. ⟨skip expr⟩ supplies a default unit of pt.

⟨font size command⟩ = ⟨dim expr⟩
⟨font size command⟩ = ⟨dim expr⟩`/`⟨skip expr⟩

The keys ⟨font size command⟩ set the keys ⟨font size command⟩`/size` or ⟨font size command⟩`/baselineskip` in a condensed format. The latter format resembles traditional typographic notation where the size and leading of a text can be expressed as, for example, 10/12 or 11/13. The number before/after the slash is the size/leading in pts.

`ignore-order = true, false`                    `initial = false`

The user should take care to ensure that the font sizes and font baselineskips remain in the correct order when directly setting the scales, sizes, or baselineskips of the different font size commands. The magnitudes of the font sizes and font baselineskips should be ordered from `\tiny` to `\normalsize` to `\Huge`. This is important for typographic and syntactic consistency. This package will issue a warning if they are not in the correct order. The user can disable this warning via the key `ignore-order = true` or just `ignore-order`.

## 4. User commands

### 4.1. Expandable font parameters

```
\CurrentFontStep
\CurrentFontScale
\CurrentFontSize
\CurrentFontBaselineskip
```

These are fully expandable commands that expand to the current font step, scale, size, or baselineskip. They can be used for printing or within calculations. Caution: `\CurrentFontStep` will expand to nothing if the current font step is undefined.

Internally, `\CurrentFontStep`, `\CurrentFontScale`, and `\CurrentFontSize` use the kernel command `\f@size`. `\CurrentFontSize` expands to `f@size pt`. `\CurrentFontBaselineskip` expands to the kernel command `\f@baselineskip`. Note that the low-level font command `\fontsize {⟨dimen⟩}{⟨skip⟩}` sets `\f@size` to the new font size before expanding its second argument. This means that `\CurrentFontStep`, `\CurrentFontScale`, and `\CurrentFontSize` may need to be first expanded if used in ⟨skip⟩. This package provides the command `\SetFontSizeBaselineskip` as an alternative to `\fontsize` + `\selectfont` that avoids this issue (§4.2).

### 4.2. More font sizing commands

The fontscale package provides the commands `\SetFontStep`, `\SetFontScale`, `\SetFontSize`, `\ScaleFont`, and `\SetFontSizeBaselineskip` which set the font size in different ways. The first three commands have a starred version which sets the font size relative to the current font size. Internally, these commands all use the low-level font commands `\fontsize` and `\selectfont`. These commands should be used only in special cases. Generally, users should prefer the font size commands from `\tiny` to `\Huge` for typographic and syntactic consistency, although `\SetFontStep*{⟨integer⟩}` can use a font size command directly.

```
\SetFontStep{⟨fp expr⟩}
\SetFontStep*{⟨fp expr⟩}
```

`\SetFontStep` sets the font size by setting the font step to ⟨fp expr⟩. The starred version `\SetFontStep*` adds ⟨fp expr⟩ to the current font step. If the choice of typographic scale is not modular or musical, then the only valid values for ⟨fp expr⟩ are the integers from $-4$ to $5$, corresponding to the font

size commands from `\tiny` to `\Huge`. `\SetFontStep` will issue an error if the calculated font step is invalid. The starred version `\SetFontStep*` will also issue an error if the current font step is invalid. `\SetFontStep` sets the font baselineskip to the calculated font size × `baselineskip-size-ratio`. If the calculated font step matches the step of any font size command, then that font size command will be used directly.

Examples:

- For example, `\SetFontStep{-2}` and `\SetFontStep{2}` use `\footnotesize` and `\Large`. Note that it is typically better to use the equivalent font size command in place of `\SetFontStep{⟨integer⟩}`.

- If the current font size is `\normalsize`, `\SetFontStep*{1}` and `\SetFontStep*{-1}` use `\large` and `\small`. This is useful for moving up or down a note on the typographic scale.

- If the choice of typographic scale is modular or musical, `\SetFontStep*{-0.5}` sets the font size and font baselineskip to values between that of `\normalsize` and `\small`. Otherwise, it produces an error.

`\SetFontScale{⟨fp expr⟩}`
`\SetFontScale*{⟨fp expr⟩}`

`\SetFontScale` sets the font size by setting the font scale to ⟨fp expr⟩. The font baselineskip is set to the calculated font size × `baselineskip-size-ratio`. The starred version `\SetFontScale*` adds ⟨fp expr⟩ to the current font scale. For example, `\SetFontScale{1.25}` makes the font size 25% larger than `\normalsize`. If the current font size is `\normalsize`, `\SetFontScale*{0.2}` is equivalent to `\SetFontScale{1.2}`.

`\SetFontSize{⟨dim expr⟩}`
`\SetFontSize*{⟨dim expr⟩}`

`\SetFontSize` sets the font size to ⟨dim expr⟩. ⟨dim expr⟩ supplies a default unit of pt. The font baselineskip is set to the calculated font size × `baselineskip-size-ratio`. The starred version `\SetFontSize*` adds ⟨dim expr⟩ to the current font size. For example, `\SetFontSize*{1}` and `\SetFontSize*{-1pt}` increase and decrease the current font size by a pt.

`\ScaleFont{⟨fp expr⟩}`

Scales the current font size and the current font baselineskip by a factor of ⟨fp expr⟩. For example, if the current font size and font baselineskip are 10 pt and 12 pt, using `\ScaleFont{0.8}` will reduce them proportionally to 8 pt and 9.6 pt.

```
\SetFontSizeBaselineskip{⟨dim expr⟩}{⟨skip expr⟩}
```

Sets the font size to ⟨dim expr⟩ and the font baselineskip to ⟨skip expr⟩.
Both arguments supply a default unit of pt. \SetFontSizeBaselineskip can
be used as an alternative to \fontsize + \selectfont as it avoids the issue
with \f@size discussed in §4.1.

### 4.3. Testing and debugging

The commands documented here are intended primarily for testing and
debugging. I have used them often when developing this package so I think
users will find them helpful.

```
\PrintFontParameters
\PrintAllFontParameters
```

\PrintFontParameters prints the current font step, scale, size, and
baselineskip in this order in a comma-separated list of key = value pairs. If
the current font step is undefined (as explained for \SetFontStep in §4.2), it
will be left blank. \PrintAllFontParameters prints the step, scale, size, and
baselineskip of each font size command.

```
\PrintSampleText[⟨text⟩]
\PrintSampleText*[⟨text⟩]
```

\PrintSampleText prints ⟨text⟩ in each font size ordered from \tiny
to \Huge each followed by a paragraph break. The starred version
\PrintSampleText* reverses the sizing order. The ⟨text⟩ can be changed via
the optional argument, but cannot contain \par tokens. The default ⟨text⟩ is
"The fontscale package: A user interface for setting document font sizes".
One useful way of printing example text is by using \PrintSampleText
[\PrintFontSizeCommand:␣\PrintFontParameters].

```
\PrintFontSizeCommand
```

\PrintFontSizeCommand tests whether the current font size and the current
font baselineskip match the font size and font baselineskip of any font
size command from \tiny to \Huge. If so, it prints the name of that font
size command, including the backslash character. If not, it instead prints
"UNDEFINED".

### 4.4. More on `\fontscalesetup`

`\fontscalesetup{⟨keyval list⟩}`

Sets and processes the fontscale package keys and then uses `\normalsize`.
`\fontscalesetup` can be applied mid-document or locally within the current
TeX group.

`reset = initial, preamble`

The key `reset` is also available. Its value must be either `initial` or
`preamble`. The key `reset = initial` or just `reset` sets all the keys to their
initial values. The key `reset = preamble` sets all the keys to their values
at the end of the preamble (or does nothing if used before the end of the
preamble).

## 5. Programming

This section is relevant to LaTeX3 programmers.

The document commands `\SetFontStep`, `\SetFontScale`, `\SetFontSize`,
`\ScaleFont`, and `\SetFontSizeBaselineskip` are set up to work with
`\text_purify:n`. `\text_purify:n` will correctly remove these commands
and their arguments. This includes the starred versions `\SetFontStep*`,
`\SetFontScale*`, and `\SetFontSize*`.

This package does not provide any public expl3 functions.

This package provides some public expl3 variables. The package stores in
public variables the step, scale, size, and baselineskip of each font size
command. These variables should not be modified directly. Instead, they
should be modified only indirectly via the command `\fontscalesetup`.

Each takes the form:

```
\c_fontscale_⟨font size command⟩_step_fp
\l_fontscale_⟨font size command⟩_scale_fp
\l_fontscale_⟨font size command⟩_size_dim
\l_fontscale_⟨font size command⟩_baselineskip_skip
```

Exception: `\l_fontscale_normalsize_scale_fp` is not defined.
The scale of `\normalsize` is instead stored as the constant
`\c_fontscale_normalsize_scale_fp`, which always equals 1.

The step, scale, size, and baselineskip of each font size command are also
stored in property lists, one for each font size command:

`\l_fontscale_⟨font size command⟩_prop`