

The *alphabet* package

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The *alphabet* package makes the standard macros for Greek letters in mathematical mode also available in text mode. This way, you can input Greek letters “by name” everywhere in the document. The mode determines whether the characters are taken from the text or math font.

With 8-bit TeX and *greek-inputenc*, literal Unicode characters can also be used in mathematical mode.¹

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¹This document was compiled with pdfTeX using the [font encoding T1](#) (8-bit fonts). For a version using Unicode fonts, see [alphabet-doc-tu.pdf](#).

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1 Requirements and Conflicts

The *alphabet* package depends on *textalpha* (both are part of *greek-fontenc*). It can be used under 8-bit TeX as well as XeTeX/LuaTeX.¹ Depending on the converter and fonts, different *limitations* apply.

The package conflicts with *unicode-math*.

It also fails, if the `utf8x` input encoding is selected. (The interface to the *ucs* package uses an incompatible definition of `\DeclareUnicodeCharacter`.)

2 Usage

Load this package in the preamble of your document (after font and math setup) with

```
\usepackage{alphabet}
```

Now you can write a single Greek symbol (like Ψ or μ) or a $\lambda\gamma\sigma$ in non-Greek text as well as ISO-conforming formulas with upright symbols² for constants like

$$A = \pi r^2$$

(instead of $A = \pi r^2$). Just like Latin letters, the Greek counterparts are by default italic in math mode³ and upright in text:

Text: $L \Gamma l \gamma$, mathematics: $L \Gamma l \gamma$

See the source of this document `alphabet-doc.tex` for a setup and usage example.

2.1 options

Package options are passed to the *textalpha* package. Example call with options:

```
\usepackage[normalize-symbols,keep-semicolon]{alphabet}
```

²The *isomath* documentation describes more alternatives for upright Greek symbols in math mode.

³Capital Greek letters are upright in TeX unless a package selects the “ISO” math-style. This document uses *isomath* with 8-bit TeX and *newtmath* with the `slantedgreek` option with Xe/LuaTeX. See the *isomath* documentation for a detailed discussion of math-styles.

normalize-symbols merges “letter” and “symbol” variants of some Greek letters (cf. Table 1 and section 2.2 below) to the “letter” character: Without this option, the symbol variant characters cannot be used in text under 8-bit LaTeX, because they are not supported by the Greek 8-bit font encoding LGR.

Attention: Be careful in cases where the distinction between the symbol variants may be important (e.g. in a mathematical or scientific context). Use XeTeX/LuaTeX with Unicode fonts or the respective characters in mathematical mode (e.g. π vs. ϖ).

keep-semicolon prevents conversion of the semicolon to an *ano teleia* in 8-bit TeX (see [textalpha-doc](#)).

Both options are ignored in text set using Unicode fonts.

2.2 symbol variants

Mathematical notation uses variant shapes of some Greek letters as additional symbols. The variations have no syntactic meaning in Greek text and text fonts may use the variant shapes in place of the “regular” ones as a stylistic choice.

Unicode defines separate code points for the symbol variants. TeX supports some of the variant shape symbols in mathematical mode, but its concept of “standard” vs. “variant” symbols differs from the distinction between “GREEK LETTER ...” vs. “GREEK ... SYMBOL” in the Unicode standard.

The *alphabet* package defines generic macros for these variants that are short forms of the set defined in `tuenc-greek.def` (cf. [test-tuenc-greek](#)):

```
\<name> selects the Unicode GREEK LETTER ... variant,  
\<name>symbol selects the Unicode GREEK ... SYMBOL variant,  
\var<name> selects the variant shape according to TeX’s mathematical mode
```

See Table 1 at the end of this document for the full list.

3 Limitations

With 8-bit TeX, the limitations described in the [textalpha documentation](#) apply (see also section 4.2). These limitations do not apply, if the text language is switched to “greek” with Babel⁴, the text part is wrapped in `\ensuregreek`, or set using Unicode fonts with XeTeX/LuaTeX.

With XeTeX/LuaTeX and Unicode fonts, literal Unicode characters cannot be used in formulas (the log file reports missing characters) This is a generic TeX limitation which *alphabet* overcomes if used under 8-bit TeX. Under XeTeX/LuaTeX it may be circumvented using the [unicode-math](#) package. Mind, that *unicode-math* conflicts with *alphabet*.

⁴ Setting the correct language for Greek text parts with the *babel* package additionally ensures correct hyphenation and upcasing.

4 Tests and examples

4.1 Greek alphabet

Greek letters via generic “name” macros without language/font-encoding switch (active font encoding T1):

A B Γ Δ E Z H Θ I K Λ M N Ξ O Π P Σ T Υ Φ X Ψ Ω F Γ 4⁵ ϱ λ
α β γ δ ε ζ η θ ι κ λ μ ν ξ ο π ρ σ ς τ υ φ χ ψ ω Ϝ ϝ Ϟ⁶ ϣ ϝ Ϟ

Greek letters via Unicode literals (active font encoding T1):

A B Γ Δ E Z H Θ I K Λ M N Ξ O Π P Σ T Υ Φ X Ψ Ω F Γ 4 ϱ λ
α β γ δ ε ζ η θ ι κ λ μ ν ξ ο π ρ σ ς τ υ φ χ ψ ω Ϝ ϝ ϣ ϝ Ϟ

4.2 Diacritics

According to Greek typographical conventions, diacritics (except the dialytika and sub iota) are placed before capital letters and dropped in UPPERCASE. Since 2022, `\MakeUppercase` only drops diacritics from Greek literals when the text language is set to `greek` with Babel or Polyglossia. Diacritics input as standard accent macros are only dropped if the Greek language is defined with Babel (i.e. not in this document). For an example using [babel-greek](#) see [char-list-alphabeta.pdf](#).

ά έ ι ῆ ὀ ὖ ὢ → A E Ī H O Υ Ω
Ά Έ Ϊ ῆ ὀ ὖ ὢ → A E Ī Ḥ ˆO ˆΥ ˆΩ → A E Ī H O Υ Ω

Certain **limitations** apply if Greek LICRs are used in a non-Greek font encoding (e.g. T1).⁷

- Composition of diacritics (like `\>\'` or `\accpsili\accoxia`) fails:
ι̇ η̇ _ο _υ >sub>ω (T1) vs. ι̇ η̇ ὀ ὖ ὢ (ΛΓΡ)
Simple diacritics and long names (like `\accdasiaoxia`) work in any font encoding.
- Accent macros do not select precomposed characters (the subtle difference becomes obvious if you drag-and-drop text from the PDF version of this document):
ǎ (T1) vs. Ḃ (ΛΓΡ)
- Wrong placement of diacritics on capital letters: Á Œ (T1) vs. Ά Ὠ (ΛΓΡ)
- Upper casing characters with diacritics leads to compilation errors unless the base letter is put in braces, e.g., `\MakeUppercase{\'\alpha}` fails, `\MakeUppercase{\'\{\alpha}}` works.

The `\ensuregreek` macro can be used to avoid these problems. It sets its argument with a font encoding supporting Greek.⁴

⁵In LGR, there is no separate glyph for uppercase Koppa.

⁶There is no separate Unicode code point for a stigma variant symbol, `\varstigma` is not defined with Xe/LuaTeX and similar to `\stigma` in some fonts.

⁷This document is typeset using 8-bit fonts.

4.3 normalize-symbols

The `normalize-symbols` option merges “letters” and “symbol” variants of some Greek letters to the “letter” character. It is ignored, if the document uses Unicode fonts and is compiled with XeTeX or LuaTeX (this document is compiled using pdfTeX).

The source of this quote uses both variants for beta ($\beta|\beta$), epsilon ($\epsilon|\epsilon$), phi ($\varphi|\varphi$), kappa ($\chi|\chi$), pi ($\pi|\pi$), rho ($\rho|\rho$), theta ($\vartheta|\vartheta$), and Theta ($\Theta|\Theta$).

4.4 Ἑλληνικά in PDF strings

With the `alphabet` package, you get Greek letters in both, the document body and PDF metadata generated by `hyperref` if the input uses Unicode literals or macros. Wrapping in `\ensuregreek` ensures the right placement of the accents and breathings (before, not above capital letters).

4.5 Greek in maths $\Gamma = \sin \alpha / \cos \beta$

In the main document, Greek in “math” mode should work as usual:

$$\Gamma = \frac{\sin \alpha}{\cos \beta}.$$

Greek letters and symbols in math mode, input as macro:⁸

$\Gamma \Delta \Theta \Lambda \Xi \Pi \Sigma \Upsilon \Phi \Psi \Omega$
 $\alpha \beta \gamma \delta \epsilon \zeta \eta \theta \iota \kappa \lambda \mu \nu \xi \pi \rho \sigma \tau \upsilon \phi \chi \psi \omega$
 $\vartheta \varphi \varpi F \rho \epsilon$

PDF strings do not know math mode. The content of a formula or equation is evaluated in text mode with non-valid commands discarded (and warnings written to the log). This works reasonably well for simple formulas (but not, e.g., for super-/subscripts). With the `alphabet` package, it works also for Greek letters.

4.6 Greek Unicode characters in math

With 8-bit TeX and `greek-inputenc`, literal Greek Unicode characters are supported also in mathematical mode.

$$\Gamma = \frac{\sin \alpha}{\cos \beta}.$$

Greek letters and symbols in math mode, input as Unicode literals:

$\Gamma \Delta \Theta \Lambda \Xi \Pi \Sigma \Upsilon \Phi \Psi \Omega$
 $\alpha \beta \gamma \delta \epsilon \zeta \eta \theta \iota \kappa \lambda \mu \nu \xi \pi \rho \sigma \tau \upsilon \phi \chi \psi \omega$
 $\vartheta \varphi \varpi F \rho \epsilon$

⁸There are no math macros for Greek letters which exist with similar shape in the Latin alphabet.

This does not work with XeTeX/LuaTeX (unless in 8-bit emulation mode). Here, *unicode-math* can be used instead of *alphabet*.

The “normal” vs. “variant” shape of letters is used so that the output matches the Unicode reference glyph (cf. Table 1). This corresponds to the behaviour of *unicode-math*.

5 Character Tables

5.1 Greek and Coptic

symbol accent macros

```
'^A · E H I O Y Ω
í A B Γ Δ E Z H Θ I K Λ M N Ξ O
Π P Σ T Υ Φ X Ψ Ω Ĩ Ÿ á é ħ í
ú α β γ δ ε ζ η θ ι κ λ μ ν ξ ο
π ρ σ τ υ φ χ ψ ω ï ü ó ú ó
β ϑ φ π ϱ ϲ Γ Ϝ F F 4 4
λ ϳ κ ϱ Θ ε
```

named accent macros

```
'^A · E H I O Y Ω
í A B Γ Δ E Z H Θ I K Λ M N Ξ O
Π P Σ T Υ Φ X Ψ Ω Ĩ Ÿ á é ħ í
ú α β γ δ ε ζ η θ ι κ λ μ ν ξ ο
π ρ σ τ υ φ χ ψ ω ï ü ó ú ó
β ϑ φ π ϱ ϲ Γ Ϝ F F 4 4
λ ϳ κ ϱ Θ ε
```

5.2 Greek Extended

symbol accent macros

```
á á ã ä å ã ã ã ã A A A A A A A A
è é ê ë ì í E E E E E E E E
ή ή ή ή ή ή ή H H H H H H H H
ì ì ì ì ì ì ì ì I I I I I I I I
ó ó ò ò ò ò O O O O O O O O
ù ù ù ù ù ù ù ù Y Y Y Y Y Y
ώ ώ ώ ώ ώ ώ ώ Ω Ω Ω Ω Ω Ω Ω Ω
à á è é η ή ì í ò ó ù ú ώ ώ
â â ã ä å ã ã ã ã A A A A A A A A
ή ή ή ή ή ή ή H H H H H H H H
ώ ώ ώ ώ ώ ώ ώ Ω Ω Ω Ω Ω Ω Ω Ω
ã ä å ã ã ã ã Á Á A A A A A A
~ ~ ή η ή ή ή E E H H H H A A
ı ı ı ı ı ı İ İ I I A A
Û Û Û Û Û Û Ÿ Ÿ Y Y P P P P
ώ ώ ώ ώ ώ ώ Ω Ω Ω Ω Ω Ω Ω Ω
```

named accent macros

```
á á ã ä å ã ã ã ã A A A A A A A A
è é ê ë ì í E E E E E E E E
ή ή ή ή ή ή ή H H H H H H H H
ì ì ì ì ì ì ì ì I I I I I I I I
ó ó ò ò ò ò O O O O O O O O
ù ù ù ù ù ù ù ù Y Y Y Y Y Y
ώ ώ ώ ώ ώ ώ ώ Ω Ω Ω Ω Ω Ω Ω Ω
à á è é η ή ì í ò ó ù ú ώ ώ
â â ã ä å ã ã ã ã A A A A A A A A
ή ή ή ή ή ή ή H H H H H H H H
ώ ώ ώ ώ ώ ώ ώ Ω Ω Ω Ω Ω Ω Ω Ω
ã ä å ã ã ã ã Á Á A A A A A A
~ ~ ή η ή ή ή E E H H H H A A
ı ı ı ı ı ı İ İ I I A A
Û Û Û Û Û Û Ÿ Ÿ Y Y P P P P
ώ ώ ώ ώ ώ ώ Ω Ω Ω Ω Ω Ω Ω Ω
```

6 PDF Strings

Generic LICRs and symbol accent macros. (Check the ToC in the PDF sidebar to see how PDF strings are handled.)

6.3 MakeUppercase

6.3.1 " A · E H I O Y Ω

6.3.2 Ĩ A B Γ Δ E Z H Θ I K Λ M N Ξ O

6.3.3 Π Ρ Σ Τ Υ Φ Χ Ψ Ω Ĩ Ÿ A E H I

6.3.4 Ÿ A B Γ Δ E Z H Θ I K Λ M N Ξ O

6.3.5 Π Ρ Σ Σ Τ Υ Φ Χ Ψ Ω Ĩ Ÿ O Y Ω

6.3.6 Β Θ Φ Π ϐ ϑ ϒ ϓ Ϝ ϝ Ϟ ϟ Ϡ ϡ Ϣ ϣ

6.3.7 λ λ κ ρ θ ε

6.3.8 A A A A A A A A A A A A A A A A

6.3.9 E E E E E E E E E E E E

6.3.10 H H H H H H H H H H H H H H H H

6.3.11 I I I I I I I I I I I I I I I I

6.3.12 O O O O O O O O O O O O O O O O

6.3.13 Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y

6.3.14 Ω Ω Ω Ω Ω Ω Ω Ω Ω Ω Ω Ω Ω Ω Ω Ω Ω Ω

6.3.15 A A E E H H I I O O Y Y Ω Ω

6.3.16 A₁ A₁ A₁ A₁ A₁ A₁ A₁ A₁ A₁ A₁ A₁ A₁ A₁ A₁ A₁ A₁ A₁ A₁ A₁

6.3.17 H₁ H₁ H₁ H₁ H₁ H₁ H₁ H₁ H₁ H₁ H₁ H₁ H₁ H₁ H₁ H₁ H₁ H₁ H₁

6.3.18 Ω₁ Ω₁ Ω₁ Ω₁ Ω₁ Ω₁ Ω₁ Ω₁ Ω₁ Ω₁ Ω₁ Ω₁ Ω₁ Ω₁ Ω₁ Ω₁ Ω₁ Ω₁ Ω₁

6.3.19 Ă Ā A₁ A₁ A₁ A A₁ Ă Ā A A A₁ ,

6.3.20 " H₁ H₁ H₁ H H₁ E E H H H₁

6.3.21 Ĩ Ĩ Ĩ Ĩ I Ĩ Ĩ Ĩ I I

6.3.22 Ÿ Ÿ Ÿ Ÿ P P Y Ÿ Ÿ Ÿ Y Y P ""

6.3.23 Ω₁ Ω₁ Ω₁ Ω Ω₁ O O Ω Ω Ω₁

macro	text	math
<code>\beta</code>	β	β
<code>\varbeta</code>	β	β
<code>\betasymbol</code>	β	β
<code>\epsilon</code>	ϵ	ϵ
<code>\varepsilon</code>	ϵ	ϵ
<code>\epsilonsymbol</code>	ϵ	ϵ
<code>\phi</code>	φ	ϕ
<code>\varphi</code>	φ	φ
<code>\phisymbol</code>	φ	ϕ
<code>\kappa</code>	κ	κ
<code>\varkappa</code>	κ	κ
<code>\kappasymbol</code>	κ	κ
<code>\pi</code>	π	π
<code>\varpi</code>	π	π
<code>\pisymbol</code>	π	π
<code>\rho</code>	ρ	ρ
<code>\varrho</code>	ρ	ρ
<code>\rhosymbol</code>	ρ	ρ
<code>\sigma</code>	σ	σ
<code>\varsigma</code>	ς	ς
<code>\finalsigma</code>	ς	ς
<code>\theta</code>	θ	θ
<code>\vartheta</code>	θ	θ
<code>\thetasymbol</code>	θ	θ
<code>\Theta</code>	Θ	Θ
<code>\varTheta</code>	Θ	Θ
<code>\Thetasymbol</code>	Θ	Θ

Table 1: Macros for Greek [symbol variants](#) (\varnothing = symbol only available with additional packages). With 8-bit TeX and the [normalize-symbols](#) option, the output for both variants in text mode is the same (8-bit Greek text fonts contain only one symbol variant).