

NAME

dvisvgm – converts DVI and EPS files to the XML-based SVG format

SYNOPSIS

dvisvgm [*options*] *file* [.dvi]

dvisvgm --eps [*options*] *file1* [.eps] *file2* [.eps] ...

dvisvgm --pdf [*options*] *file* [.pdf]

DESCRIPTION

The command-line utility **dvisvgm** converts DVI files, as generated by TeX/LaTeX, to the XML-based scalable vector graphics format SVG. It supports the classic DVI version 2 as well as version 3 (created by pTeX in vertical mode), and the XeTeX versions 5 to 7 which are also known as XDV. Besides the basic DVI commands, dvisvgm also evaluates many so-called *specials* which heavily extend the capabilities of the plain DVI format. For a more detailed overview, see section **Supported Specials** below.

Since the current SVG standard 1.1 doesn't specify multi-page graphics, dvisvgm creates separate SVG files for each DVI page. Because of compatibility reasons, only the first page is converted by default. In order to select a different page or arbitrary page sequences, use option **-p** which is described below.

SVG is a vector-based graphics format and therefore dvisvgm tries to convert the glyph outlines of all fonts referenced in a DVI page section to scalable path descriptions. The fastest way to achieve this is to extract the path information from vector-based font files available in PFB, TTF, or OTF format. If dvisvgm is able to find such a file, it extracts all necessary outline information about the glyphs from it.

However, TeX's main source for font descriptions is Metafont, which produces bitmap output (GF files). That's why not all obtainable TeX fonts are available in a scalable format. In these cases, dvisvgm tries to vectorize Metafont's output by tracing the glyph bitmaps. The results are not as perfect as most (manually optimized) PFB or OTF counterparts, but are nonetheless really nice in most cases.

When running dvisvgm without option **--no-fonts**, it creates *font* elements (`...`) to embed the font data into the SVG files. Unfortunately, only few SVG renderers support these elements yet. Most web browsers and vector graphics applications don't evaluate them properly so that the text components of the resulting graphics might look strange. In order to create more compatible SVG files, command-line option **--no-fonts** can be given to replace the font elements by plain graphics paths. Most web browsers (but only few external SVG renderers) also support WOFF and WOFF2 fonts that can be used instead of the default SVG fonts. Option **--font-format** offers the functionality to change the format applied to the fonts being embedded. This, however, only works when converting DVI files. Text present in PDF and PostScript files is always converted to path elements.

OPTIONS

dvisvgm provides a POSIX-compliant command-line interface with short and long option names. They may be given before and/or after the name of the file to be converted. Also, the order of specifying the options is not significant, i.e. you can add them in any order without

changing dvisvgm's behavior. Certain options accept or require additional parameters which are directly appended to or separated by whitespace from a short option (e.g. **-v0** or **-v 0**). Long options require an additional equals sign (=) between option name and argument but without any surrounding whitespace (e.g. **--verbosity=0**). Multiple short options that don't expect a further parameter can be combined after a single dash (e.g. **-ejs** rather than **-e -j -s**).

Long option names may also be shortened by omitting trailing characters. As long as the shortened name is unambiguous, it's recognized and applied. For example, option **--exact-bbox** can be shortened to **--exact**, **--exa**, or **--ex**. In case of an ambiguous abbreviation, dvisvgm prints an error message together with all matching option names.

-b, --bbox=*fmt*

Sets the bounding box of the generated SVG graphic to the specified format. This option only affects the conversion of DVI files. SVG documents generated from PDF and PostScript always inherit the bounding boxes of the input files.

Parameter *fmt* takes either one of the format specifiers listed below, or a sequence of four comma- or whitespace-separated length values *x1*, *y1*, *x2* and *y2*. The latter define the absolute coordinates of two diagonal corners of the bounding box. Each length value consists of a floating point number and an optional length unit (pt, bp, cm, mm, in, pc, dd, cc, or sp). If the unit is omitted, TeX points (pt) are assumed.

It's also possible to give only one length value *l*. In this case, the minimal bounding box is computed and enlarged by adding $(-l, -l)$ to the upper left and (l, l) to the lower right corner.

Additionally, dvisvgm also supports the following format specifiers:

International DIN/ISO paper sizes

An, *Bn*, *Cn*, *Dn*, where *n* is a non-negative integer, e.g. A4 or a4 for DIN/ISO A4 format (210mm × 297mm).

North American paper sizes

invoice, executive, legal, letter, ledger

Special bounding box sizes

dvi	page size stored in the DVI file
min	computes the minimal/tightest bounding box
none	no bounding box is assigned
papersize	box sizes specified by <i>papersize</i> specials present in the DVI file
preview	bounding box data computed by the preview package (if present in the DVI file)

Page orientation

The default page orientation for DIN/ISO and American paper sizes is *portrait*, i.e. *width* < *height*. Appending **-landscape** or simply **-l** to the format string switches to *landscape* mode (*width* > *height*). For symmetry reasons you can also explicitly add **-portrait** or **-p** to indicate the default portrait format. Note that these suffixes are part

of the size string and not separate options. Thus, they must directly follow the size specifier without additional blanks. Furthermore, the orientation suffixes can't be used with **dvi**, **min**, and **none**.

Note

Option **-b**, **--bbox** only affects the bounding box and does not transform the page content. Hence, if you choose a landscape format, the page won't be rotated.

-B, --bitmap-format=*fmt*

This option sets the image format used to embed bitmaps extracted from PostScript or PDF data. By default, dvisvgm embeds all bitmaps as JPEG images because it's the most compact of the two formats supported by SVG. To select the alternative lossless PNG format, **--bitmap-format=png** can be used. There are some more format variants dvisvgm currently supports even though **jpeg** and **png** should be sufficient in most cases. The following list gives an overview of the known format names which correspond to names of Ghostscript output devices.

none	disable processing of bitmap images
jpeg	color JPEG format
jpeggray	grayscale JPEG format
png	grayscale or 24-bit color PNG format depending on current color space
pnggray	grayscale PNG format
pngmono	black-and-white PNG format
pngmonod	dithered black-and-white PNG format
png16	4-bit color PNG format
png256	8-bit color PNG format
png16m	24-bit color PNG format

Since the collection of supported output devices can vary among local Ghostscript installations, not all formats may be available in some environments. dvisvgm quits with a PostScript error message if the selected output format requires a locally unsupported output device.

The two JPEG format specifiers accept an optional parameter to set the IJG quality level which must directly follow the format specifier separated by a colon, e.g.

--bitmap-format=jpeg:50. The quality value is an integer between 0 and 100. Higher values result in better image quality but lower compression rates and therefore larger files. The default quality level is 75 which is applied if no quality parameter is given or if it's set to 0.

-C, --cache[=*dir*]

To speed up the conversion process of bitmap fonts, dvisvgm saves intermediate conversion information in cache files. By default, these files are stored in

\$XDG_CACHE_HOME/dvisvgm/ or **\$HOME/.cache/dvisvgm** if

XDG_CACHE_HOME is not set. If you prefer a different location, use option **--cache** to overwrite the default. Furthermore, it is also possible to disable the font caching mechanism

completely with option **--cache=none**. If argument *dir* is omitted, dvisvgm prints the path of the default cache directory together with further information about the stored fonts. Additionally, outdated and corrupted cache files are removed.

-j, --clipjoin

This option tells dvisvgm to compute all intersections of clipping paths itself rather than delegating this task to the SVG renderer. The resulting SVG files are more portable because some SVG viewers don't support intersecting clipping paths which are defined by *clipPath* elements containing a *clip-path* attribute.

--color

Enables colorization of messages printed during the conversion process. The colors can be customized via environment variable **DVISVGM_COLORS**. See the Environment section below for further information.

--colornames

By default, dvisvgm exclusively uses RGB values of the form *#RRGGBB* or *#RGB* to represent colors in the SVG file. The latter is a short form for colors whose RGB components each consist of two identical hex digits, e.g. **#123** equals **#112233**. According to the SVG standard, it's also possible to use color names (like **black** and **darkblue**) for a limited number of predefined colors (<https://www.w3.org/TR/SVG11/types.html#ColorKeywords>). In order to apply these color names rather than their RGB values, call dvisvgm with option **--colornames**. All colors without an SVG color name will still be represented by RGB values.

--comments

Adds comments with further information about selected data to the SVG file. Currently, only font elements and font CSS rules related to native fonts are annotated.

-E, --eps

If this option is given, dvisvgm does not expect a DVI but a single or multiple EPS input files, and tries to convert them to SVG. In order to do so, a single *psfile* special command is created and forwarded to the PostScript special handler. This option is only available if dvisvgm was built with PostScript support enabled, and requires Ghostscript to be available. See option **--libgs** for further information.

-e, --exact-bbox

This option tells dvisvgm to compute the precise bounding box of each character. By default, the values stored in a font's TFM file are used to determine a glyph's extent. As these values are intended to implement optimal character placements and are not designed to represent the exact dimensions, they don't necessarily correspond with the bounds of the visual glyphs. Thus, width and/or height of some glyphs may be larger (or smaller) than the respective TFM values. As a result, this can lead to clipped characters at the bounds of the SVG graphics. With option **--exact-bbox** given, dvisvgm analyzes the actual shape of each character and derives a usually tight bounding box.

-f, --font-format=format

Selects the file format used to embed font data into the generated SVG output when converting DVI files. It has no effect when converting PDF or PostScript files. Text fragments present in these files are always converted to path elements.

Following formats are supported: **SVG** (that's the default), **TTF** (TrueType), **WOFF**, and

WOFF2 (Web Open Font Format version 1 and 2). By default, dvisvgm creates unhinted fonts that might look bad on low-resolution devices. In order to improve the display quality, the generated TrueType, WOFF, or WOFF2 fonts can be autohinted. The autohinter is enabled by appending **,autohint** or **,ah** to the font format, e.g.

--font-format=woff,autohint or **--fwoff,ah**.

Option **--font-format** is only available if dvisvgm was built with WOFF support enabled.

-m, --fontmap=filenames

Loads and evaluates a single font map file or a sequence of font map files. These files are required to resolve font file names and encodings. dvisvgm does not provide its own map files but tries to read available ones coming with dvips or dvipdfm. If option **--fontmap** is omitted, dvisvgm looks for the default map files *ps2pk.map*, *pdftex.map*, *dvipdfm.map*, and *psfonts.map* (in this order). Otherwise, the files given as option arguments are evaluated in the given order. Multiple filenames must be separated by commas without leading and/or trailing whitespace.

By default, redefined mappings do not replace previous ones. However, each filename can be preceded by an optional mode specifier (+, -, or =) to change this behavior:

+mapfile

Only those entries in the given map file that don't redefine a font mapping are applied, i.e. fonts already mapped keep untouched. That's also the default mode if no mode specifier is given.

-mapfile

Ensures that none of the font mappings defined in the given map file are used, i.e. previously defined mappings for the specified fonts are removed.

=mapfile

All mappings defined in the map file are applied. Previously defined settings for the same fonts are replaced.

If the first filename in the filename sequence is preceded by a mode specifier, dvisvgm loads the default font map (see above) and applies the other map files afterwards. Otherwise, none of default map files will be loaded automatically.

Examples: **--fontmap=myfile1.map,+myfile2.map** loads *myfile1.map* followed by *myfile2.map* where all redefinitions of **myfile2.map** are ignored.

--fontmap==myfile1.map,-myfile2.map loads the default map file followed by *myfile1.map* and *myfile2.map* where all redefinitions of *myfile1.map* replace previous entries. Afterwards, all definitions for the fonts given in *myfile2.map* are removed from the font map tree.

For further information about the map file formats and the mode specifiers, see the manuals of dvips (<https://tug.org/texinfohtml/dvips.html>) and dvipdfm (<https://ctan.org/tex-archive/dviware/dvipdfm>).

--grad-overlap

Tells dvisvgm to create overlapping grid segments when approximating color gradient fills (also see option **--grad-segments** below). By default, adjacent segments don't overlap but

only touch each other like separate tiles. However, this alignment can lead to visible gaps between the segments because the background color usually influences the color at the boundary of the segments if the SVG renderer uses anti-aliasing to create smooth contours. One way to avoid this and to create seamlessly touching color regions is to enlarge the segments so that they extend into the area of their right and bottom neighbors. Since the latter are drawn on top of the overlapping parts, the visible size of all segments keeps unchanged. Just the former gaps disappear as the background is now completely covered by the correct colors. Currently, dvisvgm computes the overlapping segments separately for each patch of the mesh (a patch mesh may consist of multiple patches of the same type). Therefore, there still might be visible gaps at the seam of two adjacent patches.

--grad-segments=*number*

Determines the maximal number of segments per column and row used to approximate gradient color fills. Since SVG 1.1 only supports a small subset of the shading algorithms available in PostScript, dvisvgm approximates some of them by subdividing the area to be filled into smaller, monochromatic segments. Each of these segments gets the average color of the region it covers. Thus, increasing the number of segments leads to smaller monochromatic areas and therefore a better approximation of the actual color gradient. As a drawback, more segments imply bigger SVG files because every segment is represented by a separate path element.

Currently, dvisvgm supports free- and lattice-form triangular patch meshes as well as Coons and tensor-product patch meshes. They are approximated by subdividing the area of each patch into a $n \times n$ grid of smaller segments. The maximal number of segments per column and row can be changed with option **--grad-segments**.

--grad-simplify=*delta*

If the size of the segments created to approximate gradient color fills falls below the given *delta* value, dvisvgm reduces their level of detail. For example, Bézier curves are replaced by straight lines, and triangular segments are combined to tetragons. For a small *delta*, these simplifications are usually not noticeable but reduce the size of the generated SVG files significantly.

-h, --help[=*mode*]

Prints a short summary of all available command-line options. The optional *mode* parameter is an integer value between 0 and 2. It selects the display variant of the help text. Mode 0 lists all options divided into categories with section headers. This is also the default if dvisvgm is called without parameters. Mode 1 lists all options ordered by the short option names, while mode 2 sorts the lines by the long option names.

A values in brackets after the description text indicate the default parameter of the option. They are applied if an option with a mandatory parameter is not used or if an optional parameter is omitted. For example, option **--bbox** requires a size parameter which defaults to **min** if **--bbox** is not used. Option **--zip**, which isn't applied by default, accepts an optional compression level parameter. If it's omitted, the stated default value 9 is used.

--keep

Disables the removal of temporary files as created by Metafont (usually .gf, .tfm, and .log files) or the TrueType/WOFF module.

--libgs=*path*

This option is only available if the Ghostscript library is not directly linked to dvisvgm and if PostScript support was not completely disabled during compilation. In this case, dvisvgm tries to load the shared GS library dynamically during runtime. By default, it expects the library's name to be **libgs.so.X** (on Unix-like systems, where **X** is the ABI version of the library) or **gsdll32.dll/gsdll64.dll** (Windows). If dvisvgm doesn't find the library, option **--libgs** can be used to specify the correct path and filename, e.g.

--libgs=/usr/local/lib/libgs.so.9 or **--libgs=\gs\gs9.25\bin\gsdll64.dll**.

Alternatively, it's also possible to assign the path to environment variable **LIBGS**, e.g.

export LIBGS=/usr/local/lib/libgs.so.9 or **set LIBGS=\gs\gs9.25\bin\gsdll63.dll**. **LIBGS** has less precedence than the command-line option, i.e. dvisvgm ignores variable **LIBGS** if **--libgs** is given.

-L, --linkmark=style

Selects the method how to mark hyperlinked areas. The *style* argument can take one of the values *none*, *box*, and *line*, where *box* is the default, i.e. a rectangle is drawn around the linked region if option **--linkmark** is omitted. Style argument *line* just draws the lower edge of the bounding rectangle, and *none* tells dvisvgm not to add any visible objects to hyperlinks. The lines and boxes get the current text color selected. In order to apply a different, constant color, a colon followed by a color specifier can be appended to the style string. A *color specifier* is either a hexadecimal RGB value of the form **#RRGGBB**, or a dvips color name (https://en.wikibooks.org/wiki/LaTeX/Colors#The_68_standard_colors_known_to_dvips).

Moreover, argument *style* can take a single color specifier to highlight the linked region by a frameless box filled with that color. An optional second color specifier separated by a colon selects the frame color.

Examples: **box:red** or **box:#ff0000** draws red boxes around the linked areas. **yellow:blue** creates yellow filled rectangles with blue frames.

-l, --list-specials

Prints a list of registered special handlers and exits. Each handler processes a set of special statements belonging to the same category. In most cases, these categories are identified by the prefix of the special statements which is usually a leading string followed by a colon or a blank, e.g. *color* or *ps*. The listed handler names, however, don't need to match these prefixes, e.g. if there is no common prefix or if functionality is split into separate handlers in order to allow them to be disabled separately using option **--no-specials**. All special statements not covered by one of the special handlers are silently ignored.

-M, --mag=factor

Sets the magnification factor applied in conjunction with Metafont calls prior tracing the glyphs. The larger this value, the better the tracing results. Nevertheless, large magnification values can cause Metafont arithmetic errors due to number overflows. So, use this option with care. The default setting usually produces nice results.

--no-merge

Puts every single character in a separate *text* element with corresponding *x* and *y* attributes. By default, new *text* or *tspan* elements are only created if a string starts at a location that differs from the regular position defined by the characters' advance values.

--no-mktexmf

Suppresses the generation of missing font files. If dvisvgm can't find a font file through the kpathsea lookup mechanism, it calls the external tools *mktexfm* or *mktexmf*. This option disables these calls.

-n, --no-fonts[=variant]

If this option is given, dvisvgm doesn't create SVG *font* elements but uses *paths* instead. The resulting SVG files tend to be larger but are concurrently more compatible with most applications that don't support SVG fonts. The optional argument *variant* selects the method how to substitute fonts by paths. Variant 0 creates *path* and *use* elements in order to avoid lengthy duplicates. Variant 1 creates *path* elements only. Option **--no-fonts** implies **--no-styles**.

-c, --scale=sx[,sy]

Scales the page content horizontally by *sx* and vertically by *sy*. This option is equivalent to **-TSsx,sy**.

-S, --no-specials[=names]

Disable processing of special commands embedded in the DVI file. If no further parameter is given, all specials are ignored. To disable a selected set of specials, an optional comma-separated list of names can be appended to this option. A *name* is the unique identifier referencing the intended special handler as listed by option **--list-specials**.

--no-styles

By default, dvisvgm creates CSS styles and class attributes to reference fonts. This variant is more compact than adding the complete font information to each text element over and over again. However, if you prefer direct font references, the default behavior can be disabled with option **--no-styles**.

-O, --optimize[=modules]

Applies several optimizations on the generated SVG tree to reduce the file size. The optimizations are performed by running separate optimizer modules specified by optional argument *modules*. It may consist of a single module name or a comma-separated list of several module names. The corresponding modules are executed one by one in the given order and thus transform the XML tree gradually.

The following list describes the currently available optimizer modules.

list

Lists all available optimizer modules and exits.

none

If this argument is given, dvisvgm doesn't apply any optimization. **none** can't be combined with other module names.

all

Performs all optimizations listed below. This is also the default if option **--optimize** is used without argument. The modules are executed in a predefined order that usually leads to the best results. **all** can't be combined with other module names.

collapse-groups

Combines nested group elements (*<g>...</g>*) that contain only a single group each. If possible, the group attributes are moved to the outermost element of the processed subtree. This module also unwraps group elements that have no attributes at all.

group-attributes

Creates groups (`<g>...</g>`) for common attributes around adjacent elements. Each attribute is moved to a separate group so that multiple common attributes lead to nested groups. They can be combined by applying optimizer module *collapse-groups* afterwards. The algorithm only takes inheritable properties, such as **fill** or **stroke-width**, into account and only removes them from an element if none of the other attributes, like **id**, prevents this.

reassign-clippaths

Collects all **clipPath** elements that differ only by their IDs. Afterwards, the duplicates are removed so that only one remains. All **clip-path** attributes referencing one of the duplicates are updated accordingly.

remove-clippaths

Removes all redundant *clipPath* elements. This optimization was already present in former versions of dvisvgm and was always applied by default. This behavior is retained, i.e. dvisvgm executes this module even if option **--optimize** is not given. You can use argument *none* to prevent that.

simplify-text

If a **text** element only contains whitespace nodes and **tspan** elements, all common inheritable attributes of the latter are moved to the enclosing text element. All **tspan** elements without further attributes are unwrapped.

simplify-transform

Tries to shorten all *transform* attributes. This module combines the transformation commands of each attribute and decomposes the resulting transformation matrix into a sequence of basic transformations, i.e. translation, scaling, rotation, and skewing. If this sequence is shorter than the equivalent *matrix* expression, it's assigned to the attribute. Otherwise, the matrix expression is used.

-o, --output=pattern

Sets the pattern that determines the names of the generated SVG files. The required parameter *pattern* may consist of an arbitrary sequence of characters which make up the filenames. With the exception of the following mentioned variables and expressions, all characters are treated as static parts of the filenames and are therefore identical for all pages processed during a run of dvisvgm. The strings **%f**, **%p**, **%P**, **%n**, **%N**, **%hd**, **%ho**, and **%hc** are variables that can be used as part of the pattern. **%f** expands to the base name of the DVI file, i.e. the filename without suffix, **%p** is the current page number, and **%P** the total number of pages in the DVI file. The variables **%n** and **%N** expand to the number of the current file being converted (starting at 1) and the total number of files given, respectively.

An optional number (0–9) specified directly after the percent sign of a variable holding a numeric value denotes the minimal number of digits to be created. If a particular value consists of less digits, the number is padded with leading zeros. Example: **%3p** enforces 3 digits for the current page number (001, 002, etc.). Without an explicit width specifier, **%p** gets the same number of digits as **%P**.

If you need more control over the numbering, you can use arithmetic expressions as part of a pattern. The syntax is **%(expr)** where *expr* may contain additions, subtractions,

multiplications, and integer divisions with common precedence. The variables **p** and **P** contain the current page number and the total number of pages, respectively. For example, `--output="%f-%(p-1)"` creates filenames where the numbering starts with 0 rather than 1.

The variables **%hX** contain different hash values computed from the DVI page data and the options given on the command-line. **%hd** and **%hc** are only set if option `--page-hashes` is present. Otherwise, they are empty. For further information, see the description of option `--page-hashes` below.

The default pattern is **%f-%p.svg** if the DVI file consists of more than one page, and **%f.svg** otherwise. That means, a DVI file *foo.dvi* is converted to *foo.svg* if *foo.dvi* is a single-page document. Otherwise, multiple SVG files *foo-01.svg*, *foo-02.svg*, etc. are produced. In Windows environments, the percent sign indicates dereferenced environment variables, and must therefore be protected by a second percent sign, e.g.

`--output=% %f-% %p`.

-p, --page=ranges

This option selects the pages to be processed. Parameter *ranges* consists of a comma-separated list of single page numbers and/or page ranges. A page range is a pair of numbers separated by a hyphen, e.g. 5–12. Thus, a page sequence might look like this: 2–4,6,9–12,15. It doesn't matter if a page is given more than once or if page ranges overlap. dvisvgm always extracts the page numbers in ascending order and converts them only once. In order to stay compatible with previous versions, the default page sequence is 1. dvisvgm therefore converts only the first page and not the whole document if option `--page` is omitted. Usually, page ranges consist of two numbers denoting the first and last page to be converted. If the conversion should start at page 1, or if it should continue up to the last DVI page, the first or second range number can be omitted, respectively. Example: `--page=-10` converts all pages up to page 10, `--page=10-` converts all pages starting with page 10. Please consider that the page values don't refer to the page numbers printed on the corresponding page. Instead, the physical page count is expected, where the first page always gets number 1.

-H, --page-hashes[=params]

If this option is given, dvisvgm computes hash values of all pages to be processed. As long as the page contents don't change, the hash value of that page stays the same. This property can be used to determine whether a DVI page must be converted again or can be skipped in consecutive runs of dvisvgm. This is done by propagating the hash value to variable **%hd** which can be accessed in the output pattern (see option `--output`). By default, dvisvgm changes the output pattern to **%f-%hd** if option `--page-hashes` is given. As a result, all SVG file names contain the hash value instead of the page number. When calling dvisvgm again with option `--page-hashes` with the same output pattern, it checks the existence of the SVG file to be created and skips the conversion if it's already present. This also applies for consecutive calls of dvisvgm with different command-line parameters. If you want to force another conversion of a DVI file that hasn't changed, you must remove the corresponding SVG files beforehand or add the parameter **replace** (see below). If you manually set the output pattern to not contain a hash value, the conversion won't be skipped.

Alternatively, the output pattern may contain the variables **%ho** and **%hc**. **%ho** expands to

a 32-bit hash representing the given command-line options that affect the generated SVG output, like **--no-fonts** and **--precision**. Different combinations of options and parameters lead to different hashes. Thus pattern **%f-%hd-%ho** creates filenames that change depending on the DVI data and the given command-line options. Variable **%hc** provides a combined hash computed from the DVI data and the command-line options. It has the same length as **%hd**.

Since the page number isn't part of the file name by default, different DVI pages with identical contents get the same file name. Therefore, only the first one is converted while the others are skipped. To create separate files for each page, you can add the page number to the output pattern, e.g. **--output="%f-%p-%hc"**.

By default, dvisvgm uses the fast XXH64 hash algorithm to compute the values provided through **%hd** and **%hc**. 64-bit hashes should be sufficient for most documents with an average size of pages. Alternatively, XXH32 and MD5 can be used as well. The desired algorithm is specified by argument *params* of option **--page-hashes**. It takes one of the strings **MD5**, **XXH32**, and **XXH64**, where the names can be given in lower case too, like **--page-hashes=md5**. Since version 0.7.1, xxHash provides an experimental 128-bit hash function whose algorithm has been stabilized as of version 0.8. When using a version prior to 0.8, the 128-bit hash values can vary depending on the used xxHash version. If the corresponding API is available, dvisvgm supports the new hash function, and option **--page-hashes** additionally accepts the algorithm specifier **XXH128**.

Finally, option **--page-hashes** can take a second argument that must be separated by a comma. Currently, only the two parameters *list* and *replace* are evaluated, e.g. **--page-hashes=md5,list** or **--page-hashes=replace**. When *list* is present, dvisvgm doesn't perform any conversion but just lists the hash values **%hd** and **%hc** of the pages specified by option **--page**. Parameter *replace* forces dvisvgm to convert a DVI page even if a file with the target name already exists.

-P, --pdf

If this option is given, dvisvgm does not expect a DVI but a PDF input file, and tries to convert it to SVG. Similar to the conversion of DVI files, only the first page is processed by default. Option **--page** can be used to select different pages, page ranges, and/or page sequences. The conversion is realized by creating a single *pdf* special command which is forwarded to the PostScript special handler. Therefore, this option is only available if dvisvgm was built with PostScript support enabled, and requires Ghostscript to be accessible. See option **--libgs** for further information.

-d, --precision=digits

Specifies the maximal number of decimal places applied to floating-point attribute values. All attribute values written to the generated SVG file(s) are rounded accordingly. The parameter *digits* accepts integer values from 0 to 6, where 0 enables the automatic selection of significant decimal places. This is also the default value if dvisvgm is called without option **--precision**.

--progress[=delay]

Enables a simple progress indicator shown when time-consuming operations like PostScript specials are processed. The indicator doesn't appear before the given delay (in seconds) has elapsed. The default delay value is 0.5 seconds.

-r, --rotate=*angle*

Rotates the page content clockwise by *angle* degrees around the page center. This option is equivalent to **-TR $angle$** .

-R, --relative

SVG allows you to define graphics paths by a sequence of absolute and/or relative path commands, i.e. each command expects either absolute coordinates or coordinates relative to the current drawing position. By default, dvisvgm creates paths made up of absolute commands. If option **--relative** is given, relative commands are created instead. This slightly reduces the size of the SVG files in most cases.

--stdin

Tells dvisvgm to read the DVI or EPS input data from **stdin** instead from a file. Alternatively to option **--stdin**, a single dash (-) can be given. The default name of the generated SVG file is *stdin.svg* which can be changed with option **--output**.

-s, --stdout

Don't write the SVG output to a file but redirect it to **stdout**.

--tmpdir[=*path*]

In some cases, dvisvgm needs to create temporary files to work properly. These files go to the system's temporary folder by default, e.g. **/tmp** on Linux systems. Option **--tmpdir** can be used to specify a different location. Please note that dvisvgm does not create this folder if it doesn't exist. Therefore, you must ensure that it's actually present before running dvisvgm.

If the optional parameter *path* is omitted, dvisvgm prints the location of the system's temp folder and exits.

-a, --trace-all=[*retrace*]

This option forces dvisvgm to vectorize not only the glyphs actually required to render the SVG file correctly – which is the default –, but processes all glyphs of all fonts referenced in the DVI file. Because dvisvgm stores the tracing results in a font cache, all following conversions of these fonts will speed up significantly. The boolean option *retrace* determines how to handle glyphs already stored in the cache. By default, these glyphs are skipped. Setting argument *retrace* to *yes* or *true* forces dvisvgm to retrace the corresponding bitmaps again.

Note

This option only takes effect if font caching is active. Therefore, **--trace-all** cannot be combined with option **--cache=none**.

-T, --transform=*commands*

Applies a sequence of transformations to the SVG content. Each transformation is described by a *command* beginning with a capital letter followed by a list of comma-separated parameters. Following transformation commands are supported:

T *tx*[,*ty*]

Translates (moves/shifts) the page in direction of vector (*tx*,*ty*). If *ty* is omitted, *ty*=0 is assumed. The expected unit length of *tx* and *ty* are TeX points (1pt = 1/72.27in). However, there are several constants defined to simplify the unit conversion (see below).

S *sx[,sy]*

Scales the page horizontally by *sx* and vertically by *sy*. If *sy* is omitted, *sy=sx* is assumed.

R *angle[,x,y]*

Rotates the page clockwise by *angle* degrees around point (x,y) . If the optional arguments *x* and *y* are omitted, the page will be rotated around its center depending on the chosen page format. When option **-bnone** is given, the rotation center is origin $(0,0)$.

KX *angle*

Skews the page along the *x*-axis by *angle* degrees. Argument *angle* can take any value except $90+180k$, where *k* is an integer.

KY *angle*

Skews the page along the *y*-axis by *angle* degrees. Argument *angle* can take any value except $90+180k$, where *k* is an integer.

FH [*y*]

Mirrors (flips) the page at the horizontal line through point $(0,y)$. Omitting the optional argument leads to $y=h/2$, where *h* denotes the page height (see *pre-defined constants* below).

FV [*x*]

Mirrors (flips) the page at the vertical line through point $(x,0)$. Omitting the optional argument leads to $x=w/2$, where *w* denotes the page width (see *pre-defined constants* below).

M *m1,...,m6*

Applies a transformation described by the 3×3 matrix $((m1,m2,m3),(m4,m5,m6),(0,0,1))$, where the inner triples denote the rows.

Note

All transformation commands of option **-T**, **--transform** are applied in the order of their appearance. Multiple commands can optionally be separated by spaces. In this case the whole transformation string has to be enclosed in double quotes to keep them together. All parameters are expressions of floating point type. You can either give plain numbers or arithmetic terms combined by the operators + (addition), - (subtraction), * (multiplication), / (division) or % (modulo) with common associativity and precedence rules. Parentheses may be used as well.

Additionally, some pre-defined constants are provided:

- ux** horizontal position of upper left page corner in TeX point units
- uy** vertical position of upper left page corner in TeX point units
- h** page height in TeX point units (0 in case of **-bnone**)
- w** page width in TeX point units (0 in case of **-bnone**)

Furthermore, you can use the 9 length constants **pt**, **bp**, **cm**, **mm**, **in**, **pc**, **dd**, **cc**, and **sp**,

e.g. **2cm** or **1.6in**. Thus, option **-TT1in,0R45** moves the page content 1 inch to the right and rotates it by 45 degrees around the page center afterwards.

For single transformations, there are also the short-hand options **-c**, **-t** and **-r** available. In contrast to the **--transform** commands, the order of these options is not significant, so that it's not possible to describe transformation sequences with them.

-t, --translate=tx[,ty]

Translates (moves) the page content in direction of vector (tx,ty) . This option is equivalent to **-TTtx,ty**.

-v, --verbosity=level

Controls the type of messages printed during a dvisvgm run:

- 0** no message output at all
- 1** error messages only
- 2** warning messages only
- 4** informational messages only

Note

By adding these values you can combine the categories. The default level is 7, i.e. all messages are printed.

-V, --version[=extended]

Prints the version of dvisvgm and exits. If the optional argument is set to *yes*, the version numbers of the linked libraries are printed as well.

-z, --zip=[level]

Creates a compressed SVG file with suffix *.svgz*. The optional argument specifies the compression level. Valid values are in the range of 1 to 9 (default value is 9). Larger values cause better compression results but may take slightly more computation time.

-Z, --zoom=factor

Multiplies the values of the *width* and *height* attributes of the SVG root element by argument *factor* while the coordinate system of the graphic content is retained. As a result, most SVG viewers zoom the graphics accordingly. If a negative zoom factor is given, the *width* and *height* attributes are omitted.

SUPPORTED SPECIALS

dvisvgm supports several *special commands* that enrich the DVI command set with additional instructions for features, like color, graphics, and hyperlinks. The term *special command*, or just *special*, originates from the TeX command `\special{...}` which does almost nothing. TeX only forwards the whole command to the DVI file and delegates its execution to the DVI driver. The DVI driver can then decide to either process or ignore it, depending on the supported statements. The parameter of TeX's `\special` command is given in curly braces and may consist of an arbitrary character sequence representing the actual instruction, for example **color Red**.

+ dvisvgm delegates the evaluation of special commands to dedicated handlers. Each handler is responsible for all special statements of the same command set, i.e. commands usually – but not necessarily – beginning with a common prefix. For example, all PDF specials start with the prefix **pdf:**, while the TPIC special set consists of 13 different commands without common identifier.

The PDF specials are processed by dvisvgm's *pdf* handler, the TPIC ones by the *tpic* handler. To get a list of the actually provided special handlers, use option **--list-specials** (see above). The following list gives an overview of the special sets currently supported. The names of the handlers can also be used to disable the processing of individual sets of specials. For further information on this, see option **--no-specials**.

bgcolor

Special statements for changing the background/page color. Currently, dvisvgm only supports the **background** statement as specified in the dvips manual (<https://tug.org/texinfohtml/dvips.html#Color-specifications>). Since SVG 1.1 doesn't support background colors, dvisvgm inserts a rectangle of the chosen color into the generated SVG document. This rectangle always gets the same size as the selected or computed bounding box. This background color command is part of the color special set but is handled separately in order to let the user turn it off.

color

Statements of this command set provide instructions to change the text/paint color. For an overview of the exact syntax, see the documentation of dvips, for instance.

dvisvgm

dvisvgm offers its own small set of specials. The following list gives a brief overview.

dvisvgm:raw *text*

Adds an arbitrary sequence of XML nodes to the page section of the SVG document. dvisvgm checks syntax and proper nesting of the inserted elements but does not perform any validation, thus the user has to ensure that the resulting SVG is still valid. Opening and closing tags may be distributed among different *raw* specials. The tags themselves can also be split but must be continued with the immediately following *raw* special. Both syntactically incorrect and wrongly nested tags lead to error messages. Parameter *text* may also contain the expressions **{?x}**, **{?y}**, **{?color}**, and **{?matrix}** that expand to the current *x* or *y* coordinate, the current color, and current transformation matrix, respectively. Character sequence **{?nl}** expands to a newline character. Finally, constructions of the form **{?(*expr*)}** enable the evaluation of mathematical expressions which may consist of basic arithmetic operations including modulo. Like above, the variables *x* and *y* represent the current coordinates. Example: **{?(-10*(x+2y)-5)}**.

dvisvgm:rawdef *text*

This command is similar to **dvisvgm:raw**, but puts the XML nodes into the `<defs>` section of the SVG document currently being generated.

dvisvgm:rawset *name* ... **dvisvgm:endrawset**

This pair of specials marks the begin and end of a definition of a named raw SVG fragment. All **dvisvgm:raw** and **dvisvgm:rawdef** specials enclosed by **dvisvgm:rawset** and **dvisvgm:endrawset** are not evaluated immediately but stored together under the given *name* for later use. Once defined, the named fragment can be referenced throughout the DVI file by **dvisvgm:rawput** (see below). The two commands **dvisvgm:rawset** and **dvisvgm:endrawset** must not be nested, i.e. each call of **dvisvgm:rawset** has to be followed by a corresponding call of **dvisvgm:endrawset** before another **dvisvgm:rawset** may occur. Also, the identifier *name* must be unique throughout the DVI file. Using **dvisvgm:rawset** multiple times together with the same *name* leads to warning messages.

dvisvgm:rawput *name*

Inserts raw SVG fragments previously stored under the given *name*. **dvisvgm** distinguishes between fragments that were specified with **dvisvgm:raw** or **dvisvgm:rawdef**, and handles them differently: It inserts all **dvisvgm:raw** parts every time **dvisvgm:rawput** is called, whereas the **dvisvgm:rawdef** portions go to the <defs> section of the current SVG document only once.

dvisvgm:img *width height file*

Creates an image element at the current graphic position referencing the given file. JPEG, PNG, and SVG images can be used here. However, **dvisvgm** does not check the file format or the file name suffix. The lengths *width* and *height* can be given together with a unit specifier (see option **--bbox**) or as plain floating point numbers. In the latter case, TeX point units are assumed (1in = 72.27pt).

dvisvgm:bbox lock

Locks the bounding box of the current page and prevents it from further updating, i.e. graphics elements added after calling this special are not taken into account in determining the extent of the bounding box.

dvisvgm:bbox unlock

Unlocks the previously locked bounding box of the current page so that it gets updated again when adding graphics elements to the page.

dvisvgm:bbox *n[ew]* *name*

Defines or resets a local bounding box called *name*. The name may consist of letters and digits. While processing a DVI page, **dvisvgm** continuously updates the (global) bounding box of the current page in order to determine the minimal rectangle containing all visible page components (characters, images, drawing elements etc.) Additionally to the global bounding box, the user can request an arbitrary number of named local bounding boxes. Once defined, these boxes are updated together with the global bounding box starting with the first character that follows the definition. Thus, the local boxes can be used to compute the extent of parts of the page. This is useful for scenarios where the generated SVG file is post-processed. In conjunction with special **dvisvgm:raw**, the macro **{?bbox *name*}** expands to the four values *x*, *y*, *w*, and *h* (separated by spaces) specifying the coordinates of the upper left corner, width, and height of the local box *name*. If box *name* wasn't previously defined, all four values equal to zero.

dvisvgm:bbox *width height [depth]* [**transform**]

Updates the bounding box of the current page by embedding a virtual rectangle (*x*, *y*, *width*, *height*) where the lower left corner is located at the current DVI drawing position (*x*,*y*). If the optional parameter *depth* is specified, **dvisvgm** embeds a second rectangle (*x*, *y*, *width*, *-depth*). The lengths *width*, *height*, and *depth* can be given together with a unit specifier (see option **--bbox**) or as plain floating point numbers. In the latter case, TeX point units are assumed (1in = 72.27pt). Depending on size and position of the virtual rectangle, this command either enlarges the overall bounding box or leaves it as is. It's not possible to reduce its extent. This special should be used together with **dvisvgm:raw** in order to update the viewport of the page properly. By default, the box extents are assigned unchanged and, in particular, are not altered by transformation commands. In order to apply the current transformation matrix, the optional modifier **transform** can be added at the end of the special statement.

dvisvgm:bbbox *a[bs]* *x1 y1 x2 y2* [**transform**]

This variant of the `bbbox` special updates the bounding box by embedding a virtual rectangle (*x1,y1,x2,y2*). The points (*x1,y1*) and (*x2,y2*) denote the absolute coordinates of two diagonal corners of the rectangle. As with the relative special variant described above, the optional modifier **transform** allows for applying the current transformation matrix to the bounding box.

dvisvgm:bbbox *f[ix]* *x1 y1 x2 y2* [**transform**]

This variant of the `bbbox` special assigns an absolute (final) bounding box to the resulting SVG. After executing this command, `dvisvgm` doesn't further alter the bounding box coordinates, except this special is called again later. The points (*x1,y1*) and (*x2,y2*) denote the absolute coordinates of two diagonal corners of the rectangle. As with the relative special variant described above, the optional modifier **transform** allows for applying the current transformation matrix to the bounding box.

The following TeX snippet adds two raw SVG elements to the output and updates the bounding box accordingly:

```
\special{dvisvgm:raw <circle cx='{?x}' cy='{?y}' r='10' stroke='black' fill='red'/>}%
\special{dvisvgm:bbbox 10bp 10bp 10bp transform}%
\special{dvisvgm:bbbox -10bp 10bp 10bp transform}
```

```
\special{dvisvgm:raw <path d='M50 200 L10 250 H100 Z' stroke='black' fill='blue'/>}%
\special{dvisvgm:bbbox abs 10bp 200bp 100bp 250bp transform}
```

em

These specials were introduced with the *emTeX* distribution by Eberhard Mattes. They provide line drawing statements, instructions for embedding MSP, PCX, and BMP image files, as well as two PCL commands. `dvisvgm` supports only the line drawing statements and ignores all other `em` specials silently. A description of the command syntax can be found in the DVI driver documentation coming with *emTeX* (<https://ctan.org/pkg/emtex>).

html

The `hyperref` specification defines several variants on how to mark hyperlinked areas in a DVI file. `dvisvgm` supports the plain HyperTeX special constructs as created with `hyperref` package option *hypertex*. By default, all linked areas of the document are marked by a rectangle. Option **--linkmark** allows you to change this behavior. See above for further details. Information on syntax and semantics of the HyperTeX specials can be found in the `hyperref` manual (<https://ctan.org/pkg/hyperref>).

papersize

The *papersize* special, which is an extension introduced by `dvips`, can be used to specify the widths and heights of the pages in the DVI file. It affects the page it appears on as well as all following pages until another *papersize* special is found. If there is more than one *papersize* special present on a page, `dvisvgm` applies the last one. However, in order to stay compatible with previous versions of `dvisvgm` that did not evaluate these specials, their processing must be explicitly enabled by adding option **--bbbox=papersize** on the command-line. Otherwise, `dvisvgm` ignores them and computes tight bounding boxes.

pdf

`pdfTeX` and `dvipdfmx` introduced several special commands related to the generation of

PDF files. Currently, only *pdf:mapfile*, *pdf:mapline*, *pdf:pagesize*, and PDF hyperlink specials are supported by dvisvgm. The latter are the PDF pendants to the HTML HyperTeX specials generated by the hyperref package in PDF mode.

pdf:pagesize is similar to the *papersize* special (see above) which specifies the size of the current and all following pages. In order to actually apply the extents to the generated SVG files, option **--bbox=papersize** must be given.

pdf:mapfile and *pdf:mapline* allow for modifying the font map tree while processing the DVI file. They are used by CTeX, for example. dvisvgm supports both, the dvips and dvi2pdfm font map format. For further information on the command syntax and semantics, see the documentation of **\pdfmapfile** in the pdfTeX user manual (<https://ctan.org/pkg/pdftex>).

ps

The famous DVI driver *dvips* (<https://www.tug.org/texinfohtml/dvips.html>) introduced its own set of specials in order to embed PostScript code into DVI files, which greatly improves the capabilities of DVI documents. One aim of dvisvgm is to completely evaluate all PostScript fragments and to convert as many of them as possible to SVG. In contrast to dvips, dvisvgm uses floating point arithmetics to compute the precise position of each graphic element, i.e. it doesn't round the coordinates. Therefore, the relative locations of the graphic elements may slightly differ from those computed by dvips.

Since PostScript is a rather complex language, dvisvgm does not implement its own PostScript interpreter but relies on Ghostscript (<https://ghostscript.com>) instead. If the Ghostscript library was not linked to the dvisvgm binary, it is looked up and loaded dynamically during runtime. In this case, dvisvgm looks for *libgs.so.X* on Unix-like systems (supported ABI versions: 7,8,9), for *libgs.X.dylib* on macOS, and for *gsdll32.dll* or *gsdll64.dll* on Windows. You can override the default file names with environment variable **LIBGS** or the command-line option **--libgs**. The library must be reachable through the ld search path (*nix) or the PATH environment variable (Windows). Alternatively, the absolute file path can be specified. If the library cannot be found, dvisvgm disables the processing of PostScript specials and prints a warning message. Use option **--list-specials** to check whether PostScript support is available, i.e. entry *ps* is present.

The PostScript handler also recognizes and evaluates bounding box data generated by the preview package (<https://ctan.org/pkg/preview>) with option *tightpage*. If such data is present in the DVI file and if dvisvgm is called with option **--bbox=preview**, dvisvgm sets the width and total height of the SVG file to the values derived from the preview data. Additionally, it prints a message showing the width, height, and depth of the box in TeX point units to the console. Especially, the depth value can be read by a post-processor to vertically align the SVG graphics with the baseline of surrounding text in HTML or XSL-FO documents, for example. Please note that SVG bounding boxes are defined by a width and (total) height. In contrast to TeX, SVG provides no means to differentiate between height and depth, i.e. the vertical extents above and below the baseline, respectively. Therefore, it is generally not possible to retrieve the depth value from the SVG file itself.

If you call dvisvgm with option **--bbox=min** (the default) and preview data is present in the DVI file, dvisvgm doesn't apply the preview extents but computes a bounding box that tightly encloses the page contents. The height, depth and width values written to console are

adapted accordingly.

tpic

The TPIC special set defines instructions for drawing simple geometric objects. Some LaTeX packages, like eepic and tplot, use these specials to describe graphics.

EXAMPLES

dvisvgm file

Converts the first page of *file.dvi* to *file.svg*.

dvisvgm -p1-5 file

Converts the first five pages of *file.dvi* to *file-1.svg*, ..., *file-5.svg*.

dvisvgm -p1- file

Converts all pages of *file.dvi* to separate SVG files.

dvisvgm -p1,3 -O file

Converts the first and third page of *file.dvi* to optimized SVG files.

dvisvgm - < file.dvi

Converts the first page of *file.dvi* to *stdin.svg* where the contents of *file.dvi* is read from **stdin**.

dvisvgm -z file

Converts the first page of *file.dvi* to *file.svgz* with default compression level 9.

dvisvgm -p5 -z3 -ba4-l -o newfile file

Converts the fifth page of *file.dvi* to *newfile.svgz* with compression level 3. The bounding box is set to DIN/ISO A4 in landscape format.

dvisvgm --transform="R20,w/3,2h/5 T1cm,1cm S2,3" file

Converts the first page of *file.dvi* to *file.svg* where three transformations are applied.

ENVIRONMENT

dvisvgm uses the **kpathsea** library for locating the files that it opens. Hence, the environment variables described in the library's documentation influence the converter.

If dvisvgm was linked without the Ghostscript library, and if PostScript support has not been disabled, the shared Ghostscript library is looked up during runtime via `dlopen()`. The environment variable **LIBGS** can be used to specify path and file name of the library.

The pre-compiled Windows versions of dvisvgm require a working installation of MiKTeX 2.9 or above. dvisvgm does not work together with the portable edition of MiKTeX because it relies on MiKTeX's COM interface that is only accessible in a local installation. To enable the evaluation of PostScript specials, the original Ghostscript DLL *gsdll32.dll* must be present and reachable through the search path. 64-bit Windows builds require the 64-bit Ghostscript DLL *gsdll64.dll*. Both DLLs come with the corresponding Ghostscript installers available from <https://ghostscript.com>.

The environment variable **DVISVGM_COLORS** specifies the colors used to highlight various parts of dvisvgm's message output. It is only evaluated if option **--color** is given. The value of **DVISVGM_COLORS** is a list of colon-separated entries of the form *gg=BF*, where *gg* denotes one of the color group indicators listed below, and *BF* are two hexadecimal digits specifying the background (first digit) and foreground/text color (second digit). The color values are defined as

follows: 0=black, 1=red, 2=green, 3=yellow, 4=blue, 5=magenta, 6=cyan, 7=gray, 8=bright red, 9=bright green, A=bright yellow, B=bright blue, C=bright magenta, D=bright cyan, E=bright gray, F=white. Depending on the terminal, the colors may differ. Rather than changing both the text and background color, it's also possible to change only one of them: An asterisk (*) in place of a hexadecimal digit indicates the default text or background color of the terminal.

All malformed entries in the list are silently ignored.

er error messages

wn warning messages

pn messages about page numbers

ps page size messages

fw information about the files written

sm state messages

tr messages of the glyph tracer

pi progress indicator

Example: **er=01:pi=*5** sets the colors of error messages (**er**) to red (**1**) on black (**0**), and those of progress indicators (**pi**) to cyan (**5**) on default background (*).

FILES

The location of the following files is determined by the kpathsea library. To check the actual kpathsea configuration you can use the **kpsewhich** utility.

***.enc** Font encoding files

***.fgd** Font glyph data files (cache files created by dvisvgm)

***.map** Font map files

***.mf** Metafont input files

***.pfb** PostScript Type 1 font files

***.pro** PostScript header/prologue files

***.tfm** TeX font metric files

***.ttf** TrueType font files

***.vf** Virtual font files

SEE ALSO

tex(1), **mf(1)**, **mktexmf(1)**, **grodvi(1)**, **potrace(1)**, and the **kpathsea library** info documentation.

RESOURCES

Project home page

<https://dvisvgm.de>

Code repository

<https://github.com/mgieseki/dvisvgm>

BUGS

Please report bugs using the bug tracker at GitHub (<https://github.com/mgieseki/dvisvgm/issues>).

AUTHOR

Written by Martin Giesekeing <martin.giesekeing@uos.de>

COPYING

Copyright © 2005–2022 Martin Giesekeing. Free use of this software is granted under the terms of the GNU General Public License (GPL) version 3 or, (at your option) any later version.