

# The LXGW Font Family\* | 落霞与孤鹜齐飞 秋水共长天一色

Designer: LXGW (霞鹜) / TrionesType (璇璣造字)† Maintainer: Mingyu Xia‡

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This package packs a selection of open-source CJK fonts from 霞鶯新繖宋, 霞鶯新晰黑, 霞鶯文楷, 霞鶯臻楷, which are released into public domain by LXGW and 朱雀仿宋 released into public domain by TrionesType since 2021. They are licensed under the IPA Font License and SIL Open Font License.

## Abstract

The LXGW Font Family provides an open-source CJK font family with a comprehensive character set for Chinese (Simplified/Traditional), Cantonese, and Japanese. A fontset configuration of this font family for the ctex-kit is also provided in this package.

## 1 Usage

Users are allowed to use the friendly interface: the fontset key in CT<sub>ε</sub>X kit

```
\documentclass[fontset = lxgw]{ctex(art|book|rep|beamer)}  
\usepackage [fontset = lxgw]{ctex}
```

with engines pdf<sub>ε</sub>X, X<sub>ε</sub><sub>ε</sub><sub>ε</sub>X, Lua<sub>ε</sub>X, up<sub>ε</sub>X, and Ap<sub>ε</sub>X supported. Four commands are provided for loading the listed regular and **bold** font files

<code>\songti</code>	宋体 (CJKmainfont): LXGWNeoZhiSong.ttf, LXGWNeoZhiSongScreen.ttf
<code>\heiti</code>	黑体 (CJKsansfont): LXGWNeoXiHei.ttf, LXGWNeoXiHeiScreen.ttf
<code>\fangsong</code>	仿宋 (CJKmonofont): LXGWZhuqueFangsong-Regular.ttf (AutoFakeBold enabled)
<code>\kaishu</code>	楷书 (it.of CJKmainfont): LXGWWenKaiGBLite-Regular.ttf, LXGWZhenKaiGB-Regular.ttf

This user-friendly interface is implemented in A.1, A.2, and A.3.

The .ttf files are sourced from the following links

- <https://github.com/lxgw/LxgwNeoZhiSong/releases/latest/download/LXGWNeoZhiSong.ttf>
- <https://github.com/lxgw/LxgwNeoXiZhi-Screen/releases/latest/download/LXGWNeoXiZhiScreen.ttf>
- <https://github.com/lxgw/LxgwNeoXiHei/releases/latest/download/LXGWNeoXiHei.ttf>
- <https://github.com/lxgw/LxgwNeoXiZhi-Screen/releases/latest/download/LXGWNeoXiZhiScreen.ttf>
- <https://github.com/TrionesType/zhuque/releases/download/v0.212/ZhuqueFangsong-v0.212.zip>
- <https://github.com/lxgw/LxgwWenkaiGB-Lite/releases/latest/download/LXGWWenkaiGBLite-Regular.ttf>
- <https://github.com/lxgw/LxgwZhenKai/releases/latest/download/LXGWZhenKaiGB-Regular.ttf>

\*<https://github.com/myhsia/LXGW-CTAN>

†<https://github.com/lxgw>, <https://github.com/TrionesType/zhuque>

‡[xiamingyu@westlake.edu.cn](mailto:xiamingyu@westlake.edu.cn)

## 2 Font Demos

The following lists the Chinese/English name, filename, and demos of the fonts: Cantonese, Japanese, Chinese (Simplified/Traditional) versions of “I Can Eat Glass”, and missing character markers are provided with punctuation compression disabled.

霞鶯新緻宋 = LXGWNeoZhiSong.ttf, LXGWNeoZhiSongScreen.ttf

私	ガ	ラ	ス	を	食	べ	ら	れ	ま	す	。	☒	そ	れ	は	私	を	傷	つ	け	ま	せ	ん	。
我	能	吞	下	玻	璃	而	不	伤	身	体	。	☒	我	能	吞	下	玻	璃	而	不	伤	身	体	。
我	能	吞	下	玻	璃	而	不	傷	身	體	。	我	可	以	食	玻	璃	，	但	傷	唔	到	我	。

霞鶯新晰黑 = LXGWNeoXiHei.ttf, LXGWNeoXiHeiScreen.ttf

私	ガ	ラ	ス	を	食	べ	ら	れ	ま	す	。	☒	そ	れ	は	私	を	傷	つ	け	ま	せ	ん	。
我	能	吞	下	玻	璃	而	不	伤	身	体	。	☒	我	能	吞	下	玻	璃	而	不	伤	身	体	。
我	能	吞	下	玻	璃	而	不	傷	身	體	。	我	可	以	食	玻	璃	，	但	傷	唔	到	我	。

朱雀仿宋 = LXGWZhuqueFangsong-Regular.ttf

私	ガ	ラ	ス	を	食	べ	ら	れ	ま	す	。	■	そ	れ	は	私	を	傷	つ	け	ま	せ	ん	。
我	能	吞	下	玻	璃	而	不	伤	身	体	。	■	我	能	吞	下	玻	璃	而	不	伤	身	体	。
我	能	吞	下	玻	璃	而	不	傷	身	體	。	我	可	以	食	玻	璃	，	但	傷	唔	到	我	。

霞鶯文楷, 霞鶯臻楷 = LXGWenKaiGBLite-Regular.ttf, LXGWZhenKaiGB-Regular.ttf

私	ガ	ラ	ス	を	食	べ	ら	れ	ま	す	。	Ⓢ	そ	れ	は	私	を	傷	つ	け	ま	せ	ん	。
我	能	吞	下	玻	璃	而	不	伤	身	体	。	Ⓢ	我	能	吞	下	玻	璃	而	不	伤	身	体	。
我	能	吞	下	玻	璃	而	不	傷	身	體	。	我	可	以	食	玻	璃	，	但	傷	唔	到	我	。

## A The Source Code

### A.1 The `ctex-fontset-lxgw.def` file

Start the optionlist fontset for l3docstrip.

```
1 (*fontset)
   Load CJK font family, the interface provided by ctex-kit accepts the following 3 branches.
2 \ctex_fontset_case:nnn
pdfTeX For those pdfTeX or  $\TeX$  + DVIPDFMx.
3 {
```

Load the `.spa` file for the CJKpunct package under pdfTeX.

```
4 \ctex_file_input:n { ctexspa-lxgw.def }
```

Case choice controlled by the `zhmap` key of ctex-kit.

```
5 \ctex_zhmap_case:nnn
```

#1: Content of this argument will be outputted to the input stream when `zhmap = zhmCJK`

```
\cs_gset_eq:NN \ctex_zhmap_case:nnn \use_i:nnn
```

The LXGW font family uses UniGB-UTF16-H Character To Glyph Index Mapping Table.

```
6 {
7   \setCJKmainfont { LXGWNeoZhiSong.ttf }
8   [
9     cmap = UniGB-UTF16-H, AutoFakeBold,
10    ItalicFont = LXGWWenKaiGBLite-Regular.ttf,
11    BoldItalicFont = LXGWZhenKaiGB-Regular.ttf
12  ]
13  \setCJKsansfont { LXGWNeoXiHei.ttf }
14  [ cmap = UniGB-UTF16-H, AutoFakeBold, AutoFakeSlant ]
15  \setCJKmonofont { LXGWZhuqueFangsong-Regular.ttf }
16  [ cmap = UniGB-UTF16-H, AutoFakeBold, AutoFakeSlant ]
17  \setCJKfamilyfont { zhsong } { LXGWNeoZhiSong.ttf }
18  [ cmap = UniGB-UTF16-H, AutoFakeBold, AutoFakeSlant ]
19  \setCJKfamilyfont { zhhei } { LXGWNeoXiHei.ttf }
20  [ cmap = UniGB-UTF16-H, AutoFakeBold, AutoFakeSlant ]
21  \setCJKfamilyfont { zhfs } { LXGWZhuqueFangsong-Regular.ttf }
22  [ cmap = UniGB-UTF16-H, AutoFakeBold, AutoFakeSlant ]
23  \setCJKfamilyfont { zhkai } { LXGWWenKaiGBLite-Regular.ttf }
24  [ cmap = UniGB-UTF16-H, AutoFakeSlant,
25    BoldFont = LXGWZhenKaiGB-Regular.ttf,
26    SlantedFont = LXGWWenKaiGBLite-Regular.ttf,
27    ItalicFont = LXGWWenKaiGBLite-Regular.ttf,
28    BoldSlantedFont = LXGWZhenKaiGB-Regular.ttf,
29    BoldItalicFont = LXGWZhenKaiGB-Regular.ttf ]
```

Configure the usages of the edge information of the defined CJK families.

```
30 \ctex_punct_set:n { lxgw }
31 \ctex_punct_map_family:nn { \CJKrmddefault } { zhsong }
32 \ctex_punct_map_family:nn { \CJKsfdefault } { zhhei }
33 \ctex_punct_map_family:nn { \CJKttdefault } { zhfs }
```

```

34         \ctex_punct_map_bfseries:nn { \CJKrmdefault, zhsong } { zhsongb }
35         \ctex_punct_map_bfseries:nn { \CJKsfdefault, zhhei } { zhheib }
36         \ctex_punct_map_itshape:nn { \CJKrmdefault } { zhkai }
37     }

```

#2: Content of this argument will be outputted to the input stream when `zhmap = true`

```
\cs_gset_eq:NN \ctex_zhmap_case:nnn \use_ii:nnn
```

Load the mapping file `ctex-zhmap-lxgw.tex` (see [A.3](#)) for zhmatrices and set `\CJKrmdefault`, `\CJKsfdefault`, `\CJKttdefault`, respectively.

```

38     {
39         \ctex_load_zhmap:nnnn { rm } { zhhei } { zhfs } { lxgw }

```

Configure the usages of the edge information of `\CJKrmdefault`.

```

40         \ctex_punct_set:n { lxgw }
41         \ctex_punct_map_family:nn { \CJKrmdefault } { zhsong }
42         \ctex_punct_map_bfseries:nn { \CJKrmdefault } { zhhei }
43         \ctex_punct_map_itshape:nn { \CJKrmdefault } { zhkai }
44     }

```

#3: Content of this argument will be outputted to the input stream when `zhmap = false`

```
\cs_gset_eq:NN \ctex_zhmap_case:nnn \use_iii:nnn
```

Here will raise a `fontset-unavailable` error.

```

45     { \ctex_fontset_error:n { lxgw } }
46 }

```

`upTeX`, `ApTeX` For those use `upTeX` + `DVIPDFMx`. Configure the basic font mapping for `upTeX`. Due to the definition in `zhmetrics-uptex`, configure

- |                            |                           |                           |
|----------------------------|---------------------------|---------------------------|
| 1. upshape of serif font.  | 3. itshape of serif font. | 5. bfseries of sans font. |
| 2. bfseries of serif font. | 4. upshape of sans font.  | 6. upshape of mono font.  |

```

47 {
48     \ctex_set_upfonts:nnnnnn
49     { LXGWNeoZhiSong.ttf }
50     { LXGWNeoZhiSongScreen.ttf }
51     { LXGWWenKaiGBLite-Regular.ttf }
52     { LXGWNeoXiHei.ttf }
53     { LXGWNeoXiHeiScreen.ttf }
54     { LXGWZhuqueFangsong-Regular.ttf }

```

Config the NFSS font families `zhsong`, `zhhei`, `zhfs`, and `zhkai` to the JFM name in normal type and bold type. Leave empty for those font families with no bold version.

```

55     \ctex_set_upfamily:nnn { zhsong } { upzhserif } { upzhserifb }
56     \ctex_set_upfamily:nnn { zhhei } { upzhsans } { upzhsans }
57     \ctex_set_upfamily:nnn { zhfs } { upzhmono } { }
58     \ctex_set_upfamily:nnn { zhkai } { upzhserifit } { }
59 }

```

X<sub>Y</sub>TeX, LuaTeX For those use X<sub>Y</sub>TeX or LuaTeX.

```
60 {
61   \setCJKmainfont { LXGWNeoZhiSong }
62   [
63     Extension      = .ttf, AutoFakeBold,
64     ItalicFont     = LXGWWenKaiGBLite-Regular,
65     BoldItalicFont = LXGWZhenKaiGB-Regular.ttf,
66   ]
67   \setCJKsansfont { LXGWNeoXiHei }
68   [ Extension = .ttf, AutoFakeBold, AutoFakeSlant ]
69   \setCJKmonofont { LXGWZhuqueFangsong-Regular }
70   [ Extension = .ttf, AutoFakeBold, AutoFakeSlant ]
71   \setCJKfamilyfont { zhsong } { LXGWNeoZhiSong }
72   [ Extension = .ttf, AutoFakeBold, AutoFakeSlant ]
73   \setCJKfamilyfont { zhhei } { LXGWNeoXiHei }
74   [ Extension = .ttf, AutoFakeBold, AutoFakeSlant ]
75   \setCJKfamilyfont { zhfs } { LXGWZhuqueFangsong-Regular }
76   [ Extension = .ttf, AutoFakeBold, AutoFakeSlant ]
77   \setCJKfamilyfont { zhkai } { LXGWWenKaiGBLite-Regular }
78   [ Extension = .ttf, BoldFont      = LXGWZhenKaiGB-Regular,
79     SlantedFont    = LXGWWenKaiGBLite-Regular,
80     ItalicFont     = LXGWWenKaiGBLite-Regular,
81     BoldSlantedFont = LXGWZhenKaiGB-Regular,
82     BoldItalicFont = LXGWZhenKaiGB-Regular ]
83 }
```

```
\songti Shortcuts that same as those in the ctex-kit.
\heiti  84 \NewDocumentCommand \songti { } { \CJKfamily { zhsong } }
\fangsong 85 \NewDocumentCommand \heiti { } { \CJKfamily { zhhei } }
\kaishu  86 \NewDocumentCommand \fangsong { } { \CJKfamily { zhfs } }
87 \NewDocumentCommand \kaishu { } { \CJKfamily { zhkai } }
```

(End of definition for `\songti` and others. These functions are documented on page 1.)

End the optionlist fontset for `l3docstrip`.

```
88 </fontset>
```

## A.2 The `ctex-spa-make-lxgw.tex` and the `ctexspa-lxgw.def` file

The `.spa` file of the corresponding font will be used for the `CJKpunct` package to achieve the punctuation compression, which can ensure the best typeset effect (under the `pdfTeX` engine). Run the following script, `ctex-spa-make-lxgw.tex` by executing

```
xetex ctex-spa-make-lxgw
```

in the terminal. Then, one can obtain the `ctexpunct-lxgw.spa` file.

Start the optionlist makespa for `l3docstrip`.

```
89 <*makespa>
```

Loading the macro file `ctex-spa-macro.tex` provided by `ctex-kit`.

```
90 \input ctex-spa-macro %
```

List all the CJK families with the corresponding font files in terms of “case-pairs”.

```

91 \MAKESPA {ctexpunct-lxgw.spa}
92 {
93   {lxgwzhsong}      {LXGWNeoZhiSong} ,
94   {lxgwzhsongb}    {LXGWNeoZhiSongScreen} ,
95   {lxgwzhhei}      {LXGWNeoXiHei} ,
96   {lxgwzhheib}     {LXGWNeoXiHeiScreen} ,
97   {lxgwzhfs}       {LXGWZhuqueFangsong-Regular} ,
98   {lxgwzhkai}      {LXGWWenKaiGBLite-Regular} ,
99   {lxgwzhkaib}     {LXGWZhenKaiGB-Regular} ,
100  }
    End of the script.
101 \primitive\end
    End the optionlist makespa for l3docstrip.
102 </makespa>
    Start the optionlist lxgw-spa for l3docstrip.
103 <*lxgw-spa>
    Define the edge information of the corresponding font families for the CJKpunct package.
104 \ctexspadef{lxgwzhsong}{10,8,9,8,67,8,58,8,71,8,65,9,67,8,65,10,55,5,54,4,64,9,71,9,0,0,10,10}
105 \ctexspadef{lxgwzhsongb}{9,7,8,7,67,8,58,8,70,8,65,8,67,8,65,9,55,5,53,3,63,8,70,8,-0,-0,10,10}
106 \ctexspadef{lxgwzhhei}{9,5,10,5,65,8,58,5,68,8,66,8,61,8,67,8,53,5,52,3,60,7,71,7,0,0,11,11,4}
107 \ctexspadef{lxgwzhheib}{9,5,9,5,64,8,57,5,68,8,65,7,61,8,67,8,53,5,52,3,60,6,70,6,0,0,11,11,4}
108 \ctexspadef{lxgwzhfs}{3,2,3,2,60,8,60,5,65,16,62,17,63,18,59,17,60,13,49,12,60,6,69,8,0,0,11,}
109 \ctexspadef{lxgwzhkai}{12,11,6,4,72,6,68,5,72,6,71,7,72,6,68,7,66,5,52,5,70,-1,72,4,0,0,12,12}
110 \ctexspadef{lxgwzhkaib}{6,8,6,8,71,4,64,5,71,5,70,6,71,5,67,6,65,4,47,4,62,3,66,3,-1,-1,10,10}
    End the optionlist lxgw-spa for l3docstrip.
111 </lxgw-spa>

```

### A.3 The ctex-zhmap-lxgw.tex file

Start the optionlist zhmap-lxgw for l3docstrip.

```

112 <*zhmap-lxgw>
    Forked from the zhmap optionlist of ctex.dtx1.
113 \begingroup\catcode61\catcode48\catcode32=10\relax%
114   \catcode 35=6 % #
115   \catcode 45=12 % -
116   \catcode123=1 % {
117   \catcode125=2 % }
118   \toks0{\endlinechar=\the\endlinechar\relax}%
119   \toks2{\endlinechar=-1 }%
120   \def\x#1 #2 {%
121     \toks0\expandafter{\the\toks0 \catcode#1=\the\catcode#1\relax}%
122     \toks2\expandafter{\the\toks2 \catcode#1=#2 }}%
123   \x 13 5 % carriage return
124   \x 32 10 % space
125   \x 35 6 % #

```

<sup>1</sup><https://github.com/CTeX-org/ctex-kit/blob/master/ctex/ctex.dtx>

```

126 \x 40 12 % (
127 \x 41 12 % )
128 \x 45 12 % -
129 \x 46 12 % .
130 \x 47 12 % /
131 \x 58 12 % :
132 \x 60 12 % <
133 \x 61 12 % =
134 \x 64 11 % @
135 \x 91 12 % [
136 \x 93 12 % ]
137 \x 123 1 % {
138 \x 125 2 % }
139 \edef\x#1{\endgroup%
140 \edef\noexpand#1{%
141 \the\toks0 %
142 \let\noexpand\noexpand\noexpand#1%
143 \noexpand\noexpand\noexpand\undefined%
144 \noexpand\noexpand\noexpand\endinput}%
145 \the\toks2}%
146 \expandafter\x\csname ctex@zhmap@endinput\endcsname
147 \begingroup\expandafter\endgroup
148 \expandafter\let\csname ifzhmappdf\expandafter\endcsname\csname
149 \expandafter\ifx\csname ifctexpdf\endcsname\relax
150 \expandafter\ifx\csname pdfoutput\endcsname\relax
151 iffalse\else\ifnum\pdfoutput < 1 iffalse\else iftrue\fi\fi
152 \else ifctexpdf\fi
153 \endcsname
154 \begingroup
155 \expandafter\ifx\csname ProvidesFile\endcsname\relax
156 \long\def\x#1\ProvidesFile#2[#3]{%
157 #1%
158 \immediate\write-1{File: #2 #3}%
159 \expandafter\xdef\csname ver@#2\endcsname{#3}}
160 \expandafter\x%
161 \fi
162 \endgroup

```

Provides the identification information of the font map loader.

```

163 \ProvidesFile{ctex-zhmap-lxgw.tex}%
164 [\LXGWFileDate\space \LXGWFileVersion\space lxgw font map loader for DVIPDFMx (CTEX)]

```

Font map loader for pdfTeX (generate PDF).

```

165 \ifzhmappdf
166 \pdfmapline{=gbk@UGBK@ <LXGWNeoZhiSong.ttf}
167 \pdfmapline{=gbksong@UGBK@ <LXGWNeoZhiSong.ttf}
168 \pdfmapline{=gbkkai@UGBK@ <LXGWWenKaiGBLite-Regular.ttf}
169 \pdfmapline{=gbkhei@UGBK@ <LXGWNeoXiHei.ttf}
170 \pdfmapline{=gbkfs@UGBK@ <LXGWZhuqueFangsong-Regular.ttf}
171 \pdfmapline{=cyberb@Unicode@ <LXGWNeoZhiSong.ttf}
172 \pdfmapline{=unisong@Unicode@ <LXGWNeoZhiSong.ttf}
173 \pdfmapline{=unikai@Unicode@ <LXGWWenKaiGBLite-Regular.ttf}

```

```

174 \pdfmapline{=unihei@Unicode@ <LXGWNeoXiHei.ttf}
175 \pdfmapline{=unifs@Unicode@ <LXGWZhuqueFangsong-Regular.ttf}
176 \pdfmapline{=gbksongs1@UGBK@ <LXGWNeoZhiSong.ttf}
177 \pdfmapline{=gbkkais1@UGBK@ <LXGWWenKaiGBLite-Regular.ttf}
178 \pdfmapline{=gbkheis1@UGBK@ <LXGWNeoXiHei.ttf}
179 \pdfmapline{=gbkfssl@UGBK@ <LXGWZhuqueFangsong-Regular.ttf}
180 \pdfmapline{=unisongs1@Unicode@ <LXGWNeoZhiSong.ttf}
181 \pdfmapline{=unikais1@Unicode@ <LXGWWenKaiGBLite-Regular.ttf}
182 \pdfmapline{=uniheis1@Unicode@ <LXGWNeoXiHei.ttf}
183 \pdfmapline{=unifssl@Unicode@ <LXGWZhuqueFangsong-Regular.ttf}

```

Configuration for pdf<sub>T</sub>E<sub>X</sub> (generate DVI).

```

184 \else

```

Configure the upright shape of `\songti`, `\kaishu`, `\heiti`, and `\fangsong` mapping for GBK encoding and UTF8 encoding.

```

185 \special{pdf:mapline gbk@UGBK@ UniGB-UTF16-H LXGWNeoZhiSong.ttf}
186 \special{pdf:mapline gbksong@UGBK@ UniGB-UTF16-H LXGWNeoZhiSong.ttf}
187 \special{pdf:mapline gbkkai@UGBK@ UniGB-UTF16-H LXGWWenKaiGBLite-Regular.ttf}
188 \special{pdf:mapline gbkhei@UGBK@ UniGB-UTF16-H LXGWNeoXiHei.ttf}
189 \special{pdf:mapline gbkfs@UGBK@ UniGB-UTF16-H LXGWZhuqueFangsong-Regular.ttf}
190 \special{pdf:mapline cyberb@Unicode@ UniGB-UTF16-H LXGWNeoZhiSong.ttf}
191 \special{pdf:mapline unisong@Unicode@ UniGB-UTF16-H LXGWNeoZhiSong.ttf}
192 \special{pdf:mapline unikai@Unicode@ UniGB-UTF16-H LXGWWenKaiGBLite-Regular.ttf}
193 \special{pdf:mapline unihei@Unicode@ UniGB-UTF16-H LXGWNeoXiHei.ttf}
194 \special{pdf:mapline unifs@Unicode@ UniGB-UTF16-H LXGWZhuqueFangsong-Regular.ttf}

```

Similar for the (fake) slant shape, set the *Afine Transformation coefficient* to 0.167, which is the same as the default value of `AutoFakeSlant` in the `xeCJK` package.

```

195 \special{pdf:mapline gbksongs1@UGBK@ UniGB-UTF16-H LXGWNeoZhiSong.ttf -s .167}
196 \special{pdf:mapline gbkkais1@UGBK@ UniGB-UTF16-H LXGWWenKaiGBLite-Regular.ttf -s .167}
197 \special{pdf:mapline gbkheis1@UGBK@ UniGB-UTF16-H LXGWNeoXiHei.ttf -s .167}
198 \special{pdf:mapline gbkfssl@UGBK@ UniGB-UTF16-H LXGWZhuqueFangsong-Regular.ttf -s .167}
199 \special{pdf:mapline unisongs1@Unicode@ UniGB-UTF16-H LXGWNeoZhiSong.ttf -s .167}
200 \special{pdf:mapline unikais1@Unicode@ UniGB-UTF16-H LXGWWenKaiGBLite-Regular.ttf -s .167}
201 \special{pdf:mapline uniheis1@Unicode@ UniGB-UTF16-H LXGWNeoXiHei.ttf -s .167}
202 \special{pdf:mapline unifssl@Unicode@ UniGB-UTF16-H LXGWZhuqueFangsong-Regular.ttf -s .167}
203 \fi

```

End the optionlist `zhmap-lxgw` for `l3docstrip`.

```

204 </zhmap-lxgw>

```

# Index

The italic numbers denote the pages where the corresponding entry is described, numbers underlined point to the definition, all others indicate the places where it is used.

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