21.1 Foreword

L-Hypoid Gear Design System can design the gear dimension, the tooth profile and strength calculation in the total and so on. A general hypoid gear is formed from the bevel gear generating machine. Therefore, a tooth profile is decided by the exercise of the tool and the machine. However, this software gives the offset to the spiral bevel gear with spherical involute tooth profile, it analyzes and decides the tooth profile of the pinion. The screen of L-Hypoid Gear Design software is shown in Fig. 21.1.

21.2 Gear dimensions

The dimension setting screen is shown in Fig. 21.2. It is possible to input the standard value, when numerical value is uncertain, and it is possible that spiral angles, tooth thickness, offset and tool radii, etc. are freely set.

21.3 Dimension calculation result

Each part dimension of the hypoid gears is calculated based on the AGMA2005-B88 standard. The dimension result is shown in Fig. 21.3.

Analysis accuracy, crowning and tip relief of the tooth profile are set in Fig. 21.4 in the modified gear dimension input screen. Reference figure of crowning and tip relief is shown in Fig. 21.5 (a) and 21.5 (b). When adjusting a tooth contact pattern, it adjusts Crt and Crwt in Fig. 21.4 (a).
21.4 Assembly drawing
The hypoid gear dimension and position are shown in Fig. 21.6.

(a) Right position  (b) Left position
Fig.21.6 Position of Hypoid gear

21.5 Gear strength
21.5.1 Power setting
The strength calculation of the hypoid gear is based on the ANSI / AGMA 2003-A86 standard. Power specification setting is shown in Fig. 21.7. Also, Life Factor graph is shown in Fig. 21.8 and Fig. 21.9.

21.5.2 Geometry factor
The standard value of geometry factor (I, J) are shown in Fig. 21.10, but the graph of Fig.21.11 and Fig.21.12 can be freely changed by consulting.

21.5.3 Material
The setting screen of the material, heat-treatment, hardness and the permissible stress number are shown in Fig.21.13.

21.5.4 Gear strength value
The strength result of the hypoid gear is shown in Fig. 21.14.
21.5.5 Lifetime of the gear

The gear lifetime calculation result is shown in Fig. 21.15.

![Fig.21.15 Lifetime of the gear](image)

21.6 Tooth rendering

The analysis of the tooth profile is based on the distribution number to the direction of the face width and the direction of the tooth height. A tooth rendering is shown in Fig. 21.16 and Fig. 21.17. The tooth profile rendering which is shown in Fig. 21.18 is the figure which piled Fig. 21.17 with the cutting cutter.

![Fig.21.16 Tooth rendering-1](image)

![Fig.21.17 Tooth rendering-2](image)

![Fig.21.18 Tooth rendering-3 (+Conjugation cutter)](image)

The generation procedure of the tooth profile of both gear is shown below.

1. The tooth profile of the gear is a spherical involute curve.
2. The spiral curve of the gear is decided at the tool radius in Fig. 21.2.
3. The tooth profile of the pinion considers an offset and is generating the tooth profile which meshes with the gear.

21.7 CAD file

The tooth profile of the pinion and the gear can be output in DXF and the IGES file. A file output form is shown in Fig. 21.19. Then, CAD drawing a figure example is shown in Fig. 21.20 and Fig. 21.21.

![Fig.21.19 Output form of CAD data](image)

![Fig.21.20 CAD-drawing example (Pinion-3D-IGES)](image)

![Fig.21.21 CAD-drawing example (Gear-3D-IGES)](image)
21.8 Analysis of tooth contact pattern (Optional)

Analysis setting and an analysis sample of tooth contact pattern are shown in Fig. 21.22 and Fig. 21.23. Also, contact value is shown in Fig. 21.24.

![Fig.21.22 Setting of tooth contact pattern](image)

Fig. 21.22 Setting of tooth contact pattern

![Fig.21.23 Contact pattern of teeth](image)

Fig. 21.23 Contact pattern of teeth

![Fig.21.23a Control form](image)

Fig. 21.23a Control form

![Fig.21.24 Contact pattern of teeth (Value)](image)

Fig. 21.24 Contact pattern of teeth (Value)

21.9 Bearing load

The setting of bearing computation and the calculation example of the bearing load are shown in Fig. 21.25 and Fig. 21.26.

![Fig.21.25 Setting of bearing load-1](image)

Fig. 21.25 Setting of bearing load-1

![Fig.21.26 Setting of bearing load-2](image)

Fig. 21.26 Setting of bearing load-2

![Fig.21.26a Bearing support example](image)

Fig. 21.26a Bearing support example

21.10 Required System Configuration

(1) Operating system
Windows XP or Windows 7

(2) Computer
Personal computer with Pentium 1 GHz or faster capable of running Windows

(3) CD-ROM drive

(4) Windows-compatible monitor with 1024 × 768 or higher resolution

(5) 1GB or more of available memory space

(6) 1GB or more of available hard disk space

(7) Windows-compatible mouse or other pointing device

(8) Windows-compatible printer