



# Aero Engine Speed Reducer Project

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## Mechanical Design B

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GP100 / 400 – Gear Design Software

Version 1.4

*When I am working on a problem, I never think about beauty but when I have finished, if the solution is not beautiful, I know it is wrong - R. Buckminster Fuller (1895-1983)*

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Nota bene: There is no obligation to use GP100/ GP 400 to specify your gears, but it does present all of the required specification information/. You may calculate your gear geometry by hand or use other software. GP100 although archaic, is very stable and effective.

## Running the software

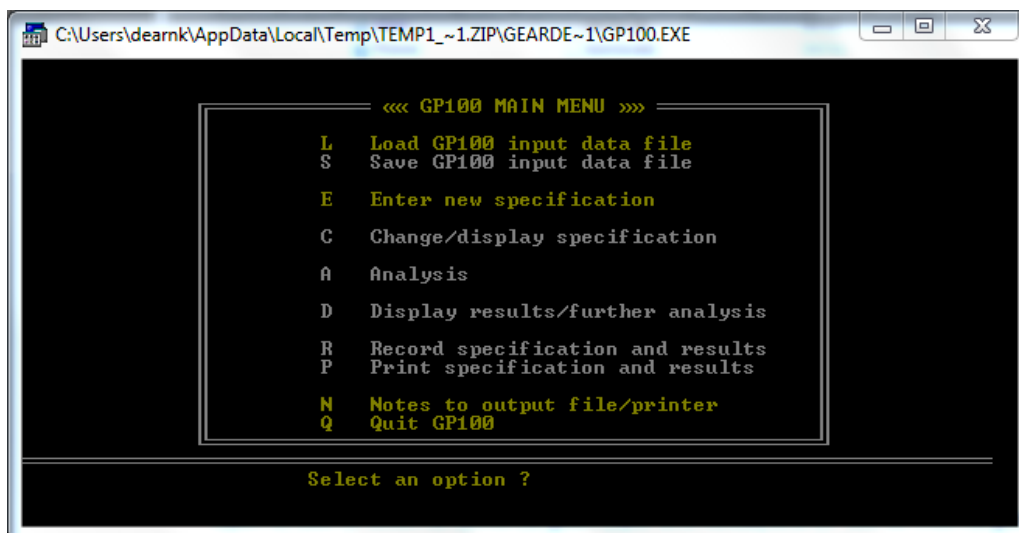
If you are running 64-bit operating system, then the programme will not run, you will need to install a Dos emulator: this is the best that I have found

<http://www.dosbox.com/download.php?main=1>

Or you can use this website: <https://virtualconsoles.com/online-emulators/dos/>

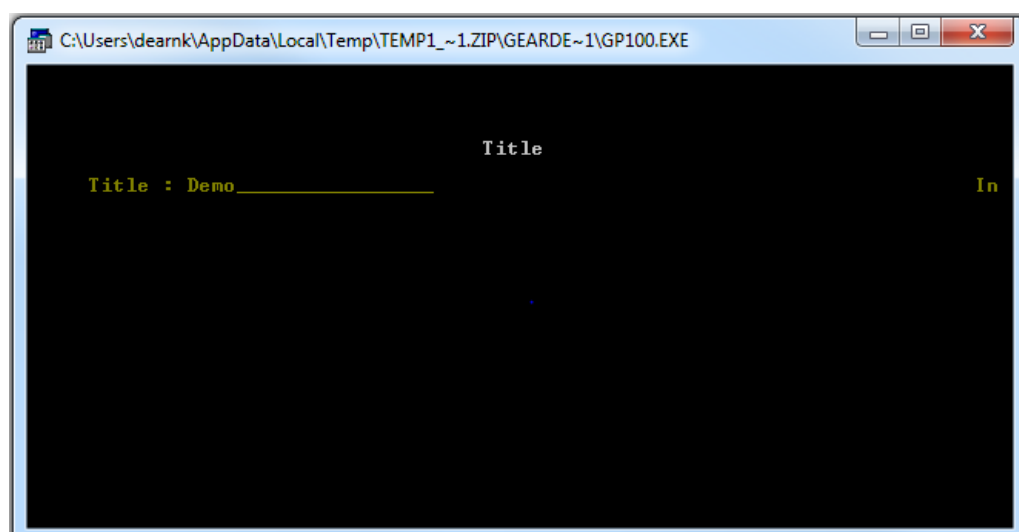
## Main menu

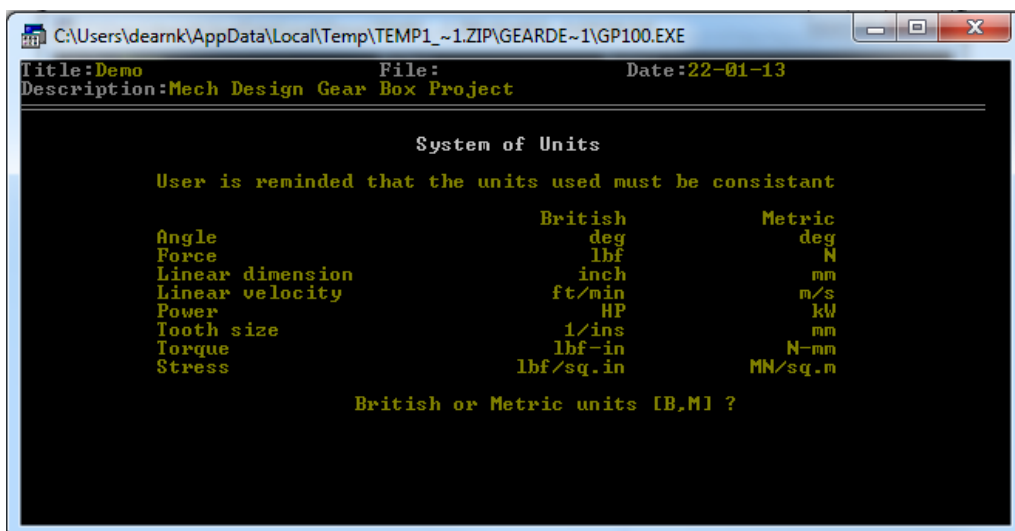
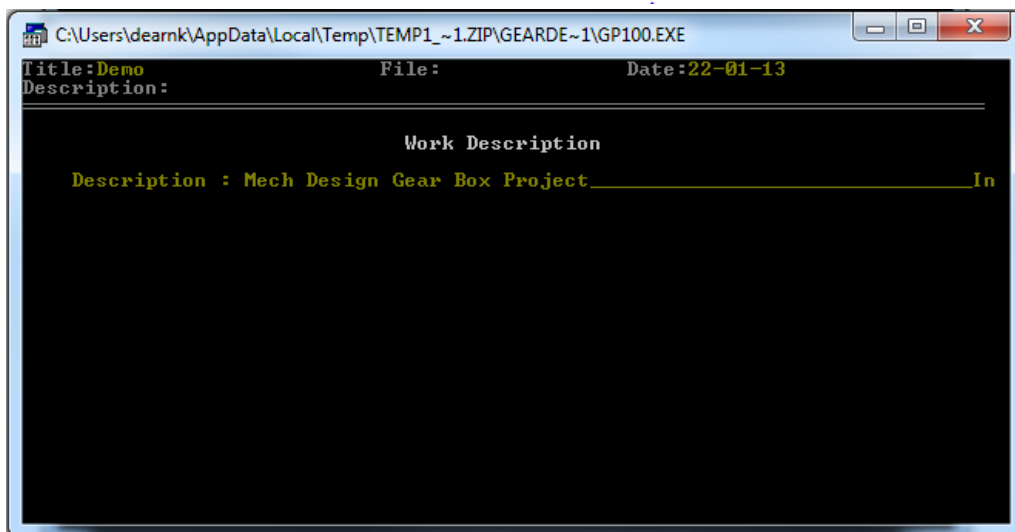
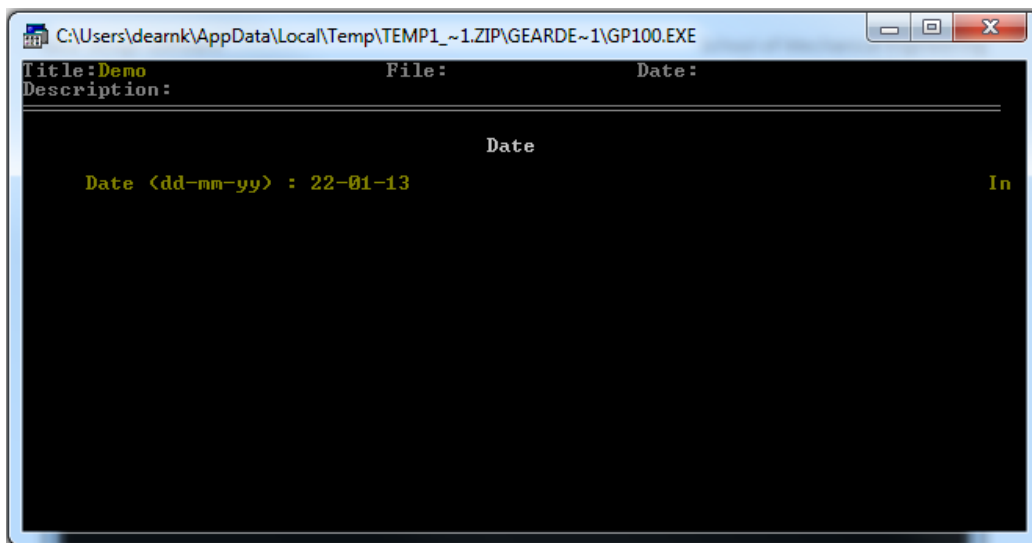
Open GP100 for external cylindrical gears (spur and helical) and GP 400 for internal gears.  
(From the opening menu hit return twice to arrive at the following screen)



Hit 'E' - Enter new specification

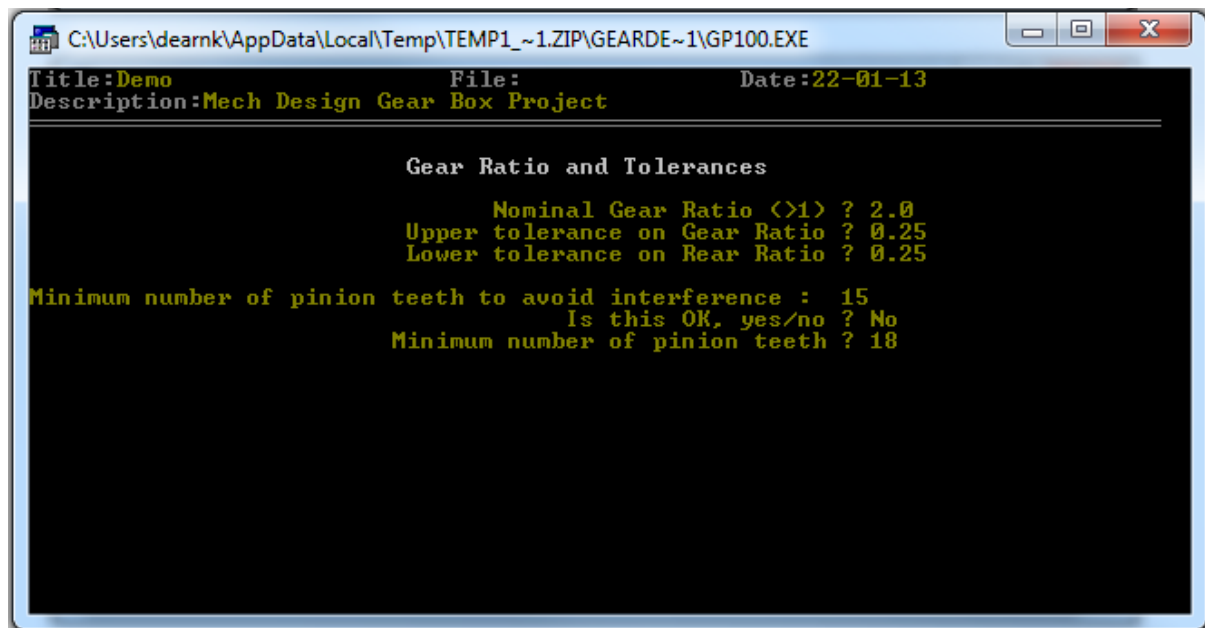
## Preparatory information (hit enter after entering data)





Select the unit system that you would like to work in [B] for imperial units [M] for metric

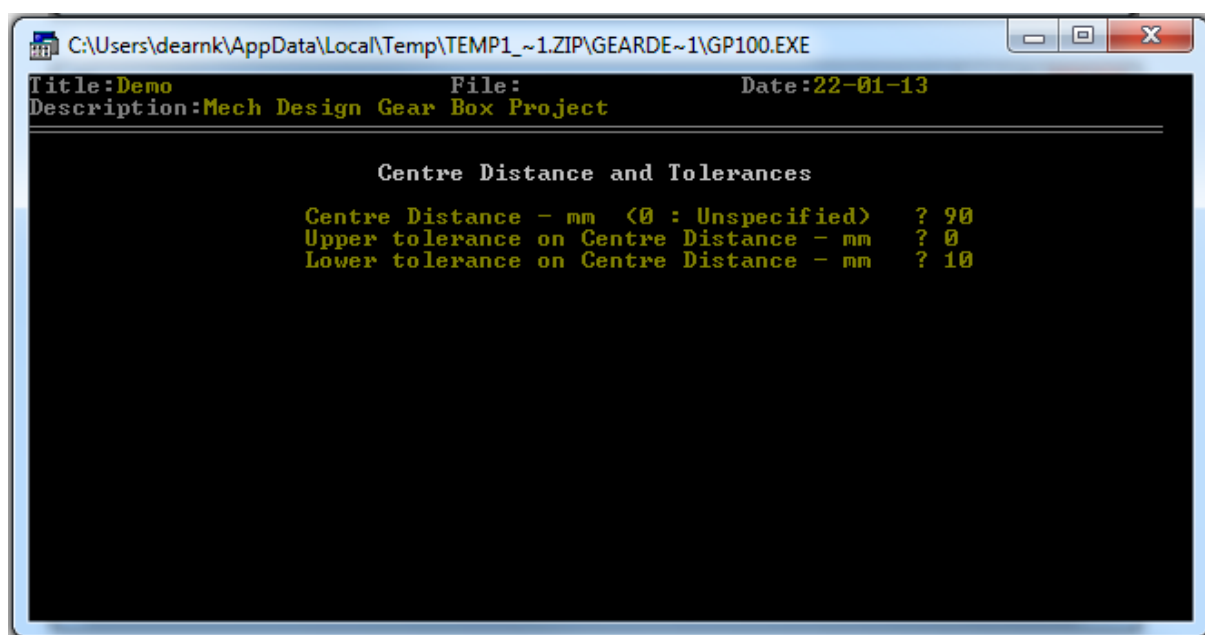
## Specification of transmission requirements



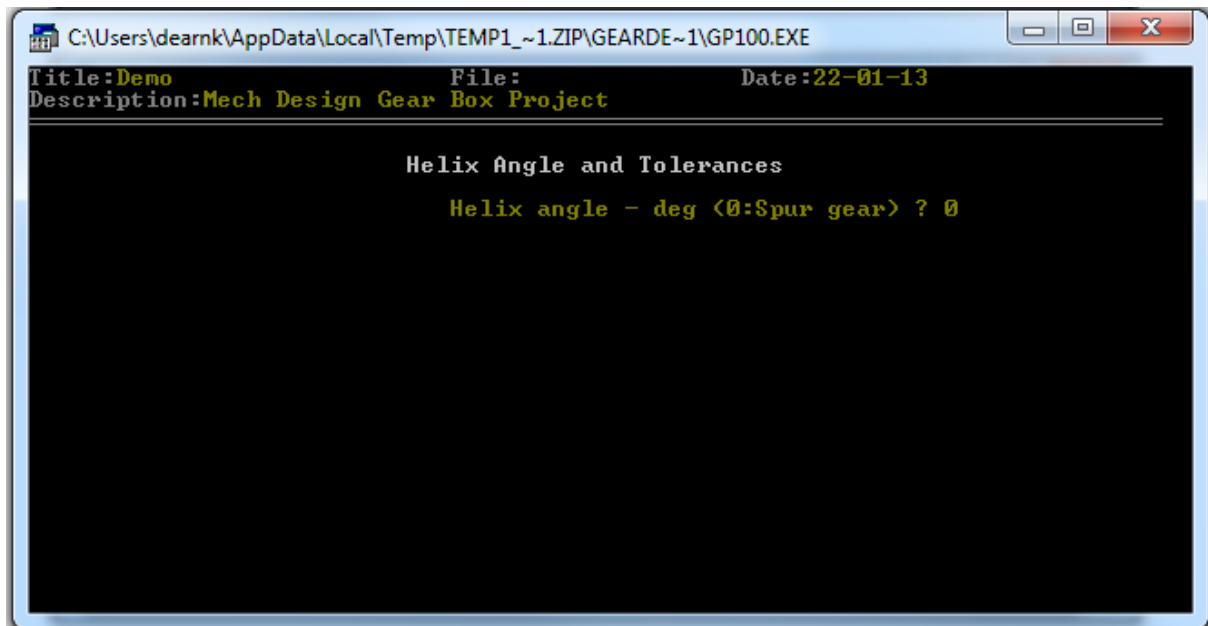
Enter your gear ratio, and the upper and lower tolerances on this value you have calculated.

*Question: What is an acceptable tolerance? – Remember any tolerance added will affect, ultimately, the transmitted torque and output shaft speed. If you lock the ratio down too tightly, you may struggle to find standard components!*

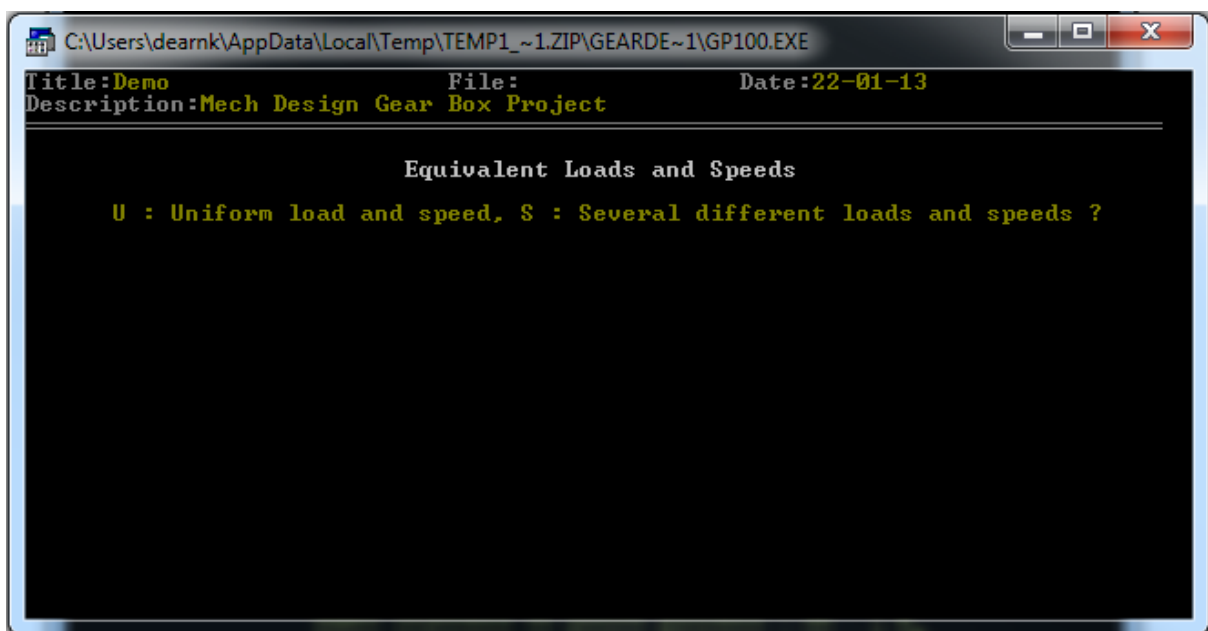
You also need to specify the minimum number of pinion teeth to avoid undercutting – refer back to the Gear learning pack.



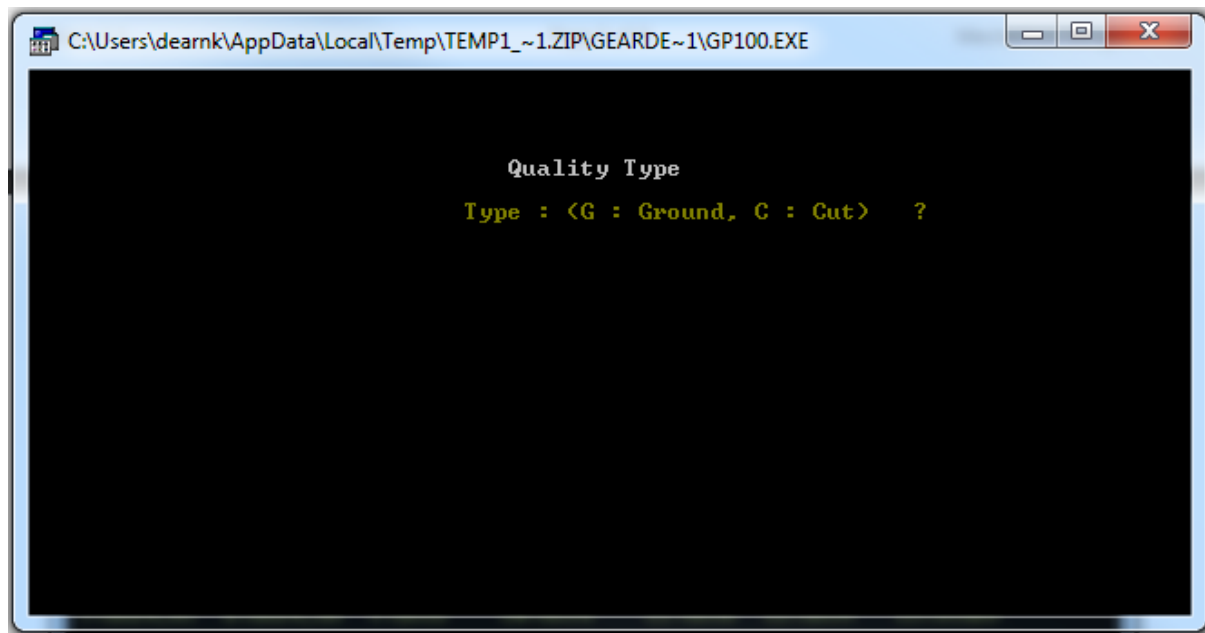
Enter centre distance again with tolerances (these will be governed by the application)



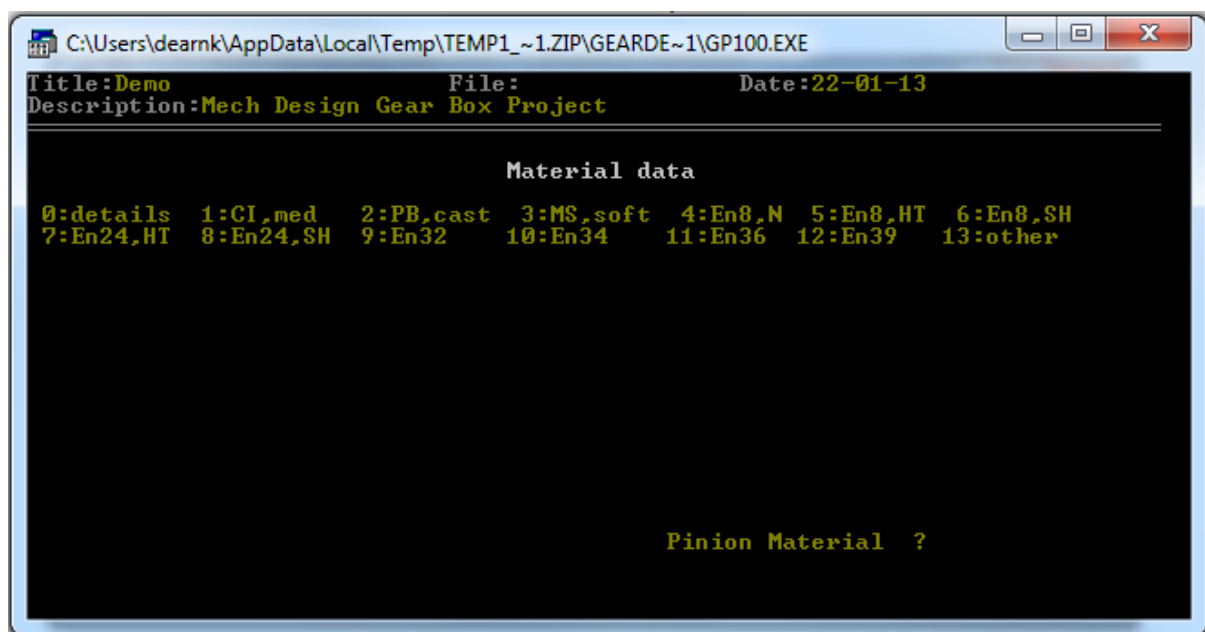
Select helix angle for your gears, note: a helix of zero specifies a spur gear



Use [U] for one speed/ load condition and [S] for multiple conditions. If using [S] you will need to input, the number conditions, and the number of hours, speed and power for each condition. Otherwise, for a single speed/ load enter power, input speed and hours (rated life).

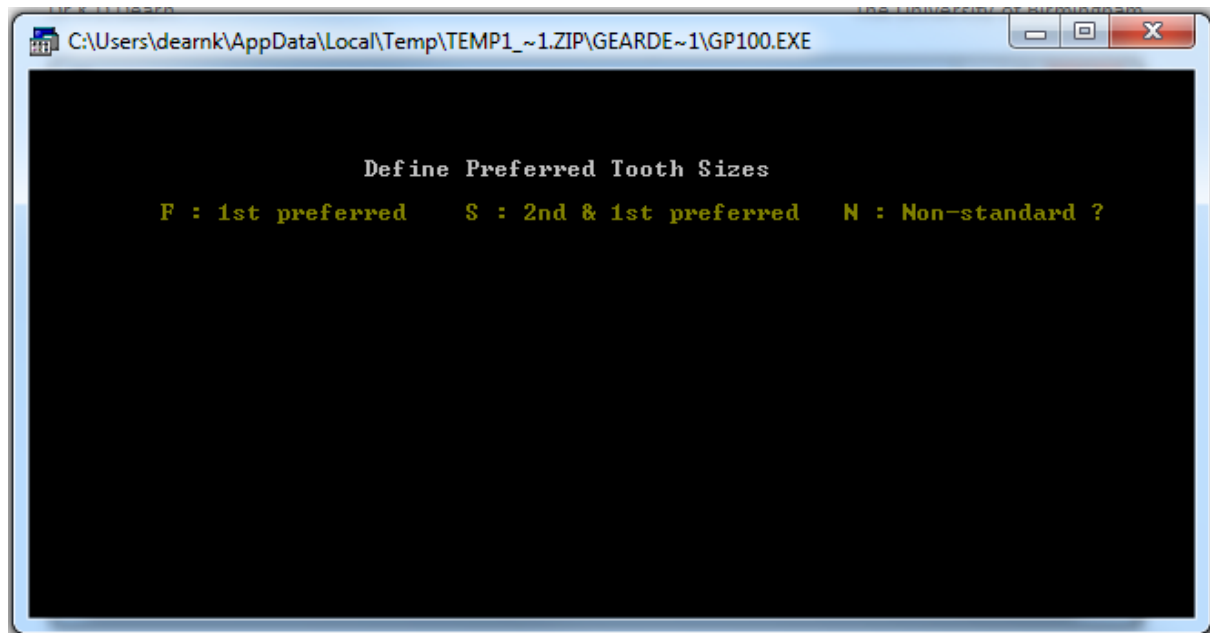


Specify the quality of the manufactured gears – ground gears (high surface finish etc. but more expensive) or Cut (i.e. machined) gears



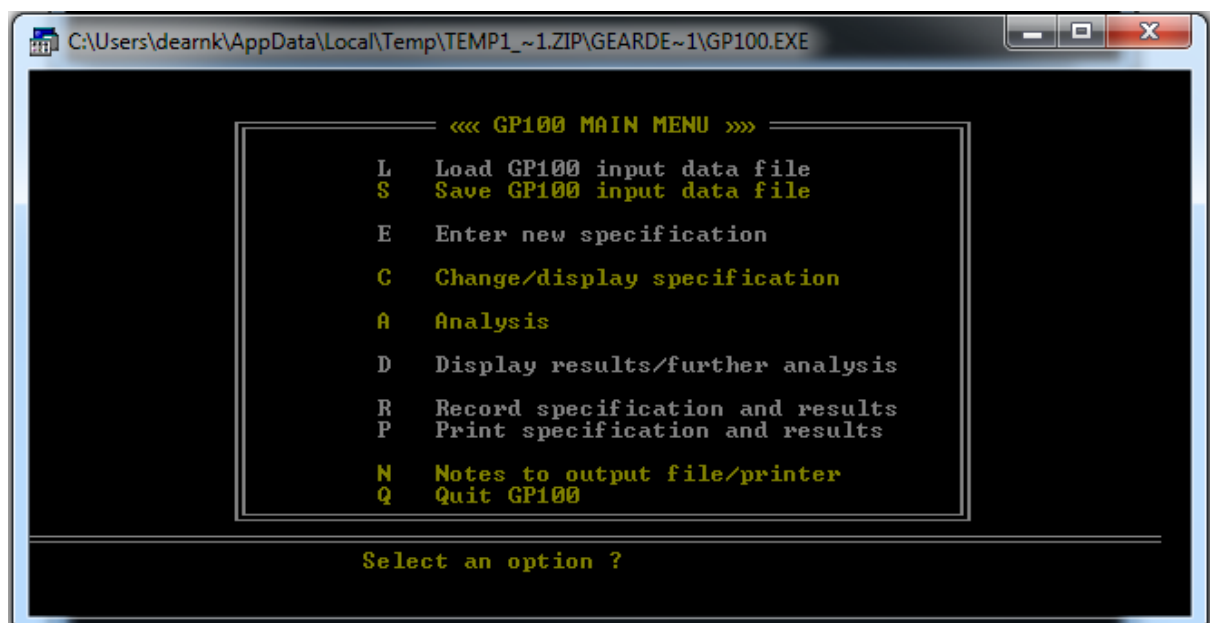
Specify materials for pinion and wheel - You will need to do some research as to what properties you require.

*Question: What affect does the gear ratio have on the wear of gears? Think about how many times the pinion rotates in comparison to the wheel].*



Specify whether you wish to use gears of standard proportions (i.e. 1<sup>st</sup> preferred so-called off the shelf), or bespoke, non-standard gears.

## Analysis results



Hit [A] - Enter Analysis

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C:\Users\dearnk\AppData\Local\Temp\TEMP1_~1.ZIP\GEARDE~1\GP100.EXE

DESIGN RESULTS
-----
Pinion teeth : 18      Wheel teeth : 34
Normal module : 3.000 mm
Gear ratio : 1.8889   Error : -0.1111

Spur gear

Centre dist. : 81.00 mm  Error : -9.00 mm
Centre distance extension : 3.000 mm

Facewidth : 223.50 mm : 74.50 x module
Reasonable FW : 18.85 to 39.00 mm
Operating pressure angle : 25.2 deg
Facewidth ratio of pinion and wheel wear : 0.40
Facewidth ratio of pinion and wheel strength : 0.90

** Wheel wear governs facewidth
** Facewidth HIGH
** Recommendation :
    Increase material quality or centre distance or increase tooth size

Pause
```

This screen gives you details of:

- Number of teeth on pinion and wheel
- Module
- Centre distance (extension should be considered as a tolerance)
- Facewidth (recommended and acceptable range)
- Pressure angle

If your design is not good, the programme offers suggestions as to how you can improve, to do this you will need to re-enter some aspects of the specification

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C:\Users\dearnk\AppData\Local\Temp\TEMP1_~1.ZIP\GEARDE~1\GP100.EXE

<<< Display Menu >>>
R: display design Results
D: display design Details
U: View gears
P: view a Pinion tooth

<<< Further Analysis >>>
M: select new Material(s)
T: select new Tooth size
S: Specify pinion teeth
I: Increase wheel/pinion teeth

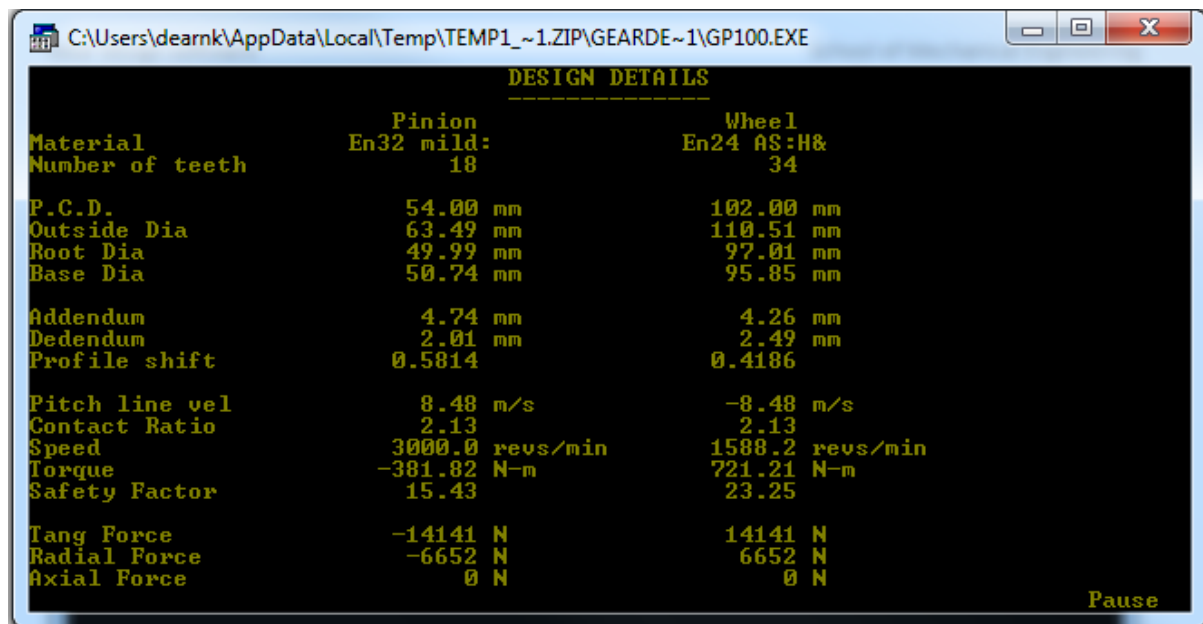
X: eXit to main menu
Change/Display specification, re-run GP100

Select an option ?
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Hit [D] - Enter Display results

[Note: use the further analysis menu to re-enter data for changing specification, to re-enter all of the data hit [X] to return to main menu].





This screen is important, it gives you details of:

Pinion/ Wheel materials

The important radii of your gears

The contact ratio

Torque transmitted by the gears

Forces transmitted by the gears

[Note: these last two parameters will be vital for you to specify your shafts and bearings]

**MOST IMPORTANTLY DON'T BE AFRAID TO 'PLAY' WITH THE SOFTWARE.**