

# CNC Machining of a Spur Gear

Gear Manufacturing and Metrology Project- May 2018

## **Problem:**

Create a G-code program to draw and manufacture a gear using motion in accordance with the generation principle on a five-axis milling machine. The parameters of the gear are as follows:

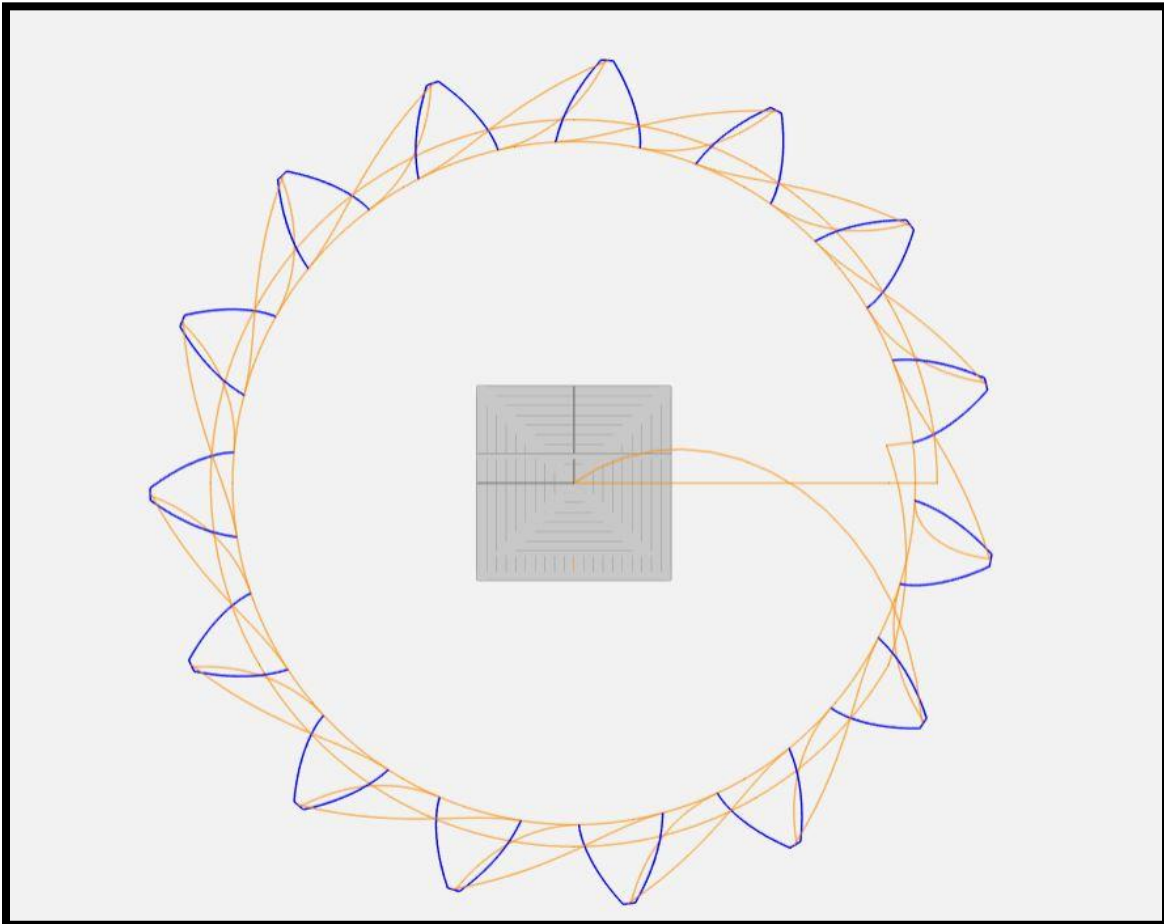
Module: 5 mm

Transverse Pressure Angle: 20 degrees

Number of Teeth: 15

Helix Angle: 0 degrees

## Output



## Input Code

```
%  
O2000 (Gear MnM - RAJPUT);
```

```
(Introductory Stuff);  
G58 G80 G90 G49 G94;  
G91 G28 Z0;  
G91 G28 X0 YO;  
M6 T12;  
G43 H10;  
G90;  
M11;  
M69;  
G91 G28 B0 C0;  
M68;  
G90 C0;
```

```
N1 (Root Circle - Solid);
```

G00 G90 Y32.5 X0;  
Z10.0;  
G01 Z0 F500.0;  
G91 C360.0 F500.0;  
G00 G90 Z10.0;

N2 (Base Circle - Dashed);  
C0;  
X0 Y35.2385;  
G01 Z0;  
C20.0;  
G0 Z10.0;  
C40.0;  
G01 Z0;  
C60.0;  
G00 Z10.0;  
C80.0;  
G01 Z0.0;  
C100.0;  
G00 Z10.0;  
C120.0;  
G01 Z0.0;  
C140.0;  
G00 Z10.0;  
C160.0;  
G01 Z0.0;  
C180.0;  
G00 Z10.0;  
C200.0;  
G01 Z0.0;  
C220.0;  
G00 Z10.0;  
C240.0;  
G01 Z0.0;  
C260.0;  
G00 Z10.0;  
C280.0;  
G01 Z0.0;  
C300.0;  
G00 Z10.0;  
C320.0;  
G01 Z0.0;  
C340.0;  
G00 Z10.0;

N3 (Pitch Circle - Dashed);

C0;

X0 Y37.5;

G01 Z0;

C30.0;

G0 Z10.0;

C60.0;

G01 Z0;

C90.0;

G00 Z10.0;

C120.0;

G01 Z0.0;

C150.0;

G00 Z10.0;

C180.0;

G01 Z0.0;

C210.0;

G00 Z10.0;

C240.0;

G01 Z0.0;

C270.0;

G00 Z10.0;

C300.0;

G01 Z0.0;

C330.0;

G00 Z10.0;

N4 (Involute);

G90 X0 Y32.5 C6.854;

G01 Z0 F500.0 (Note slow approach, G01);

X0 Y35.2385 (Start position for actual involute);

G93 X25.929 C49.0131 F6.0 (Inv. Time Feedrate, Note G93);

G94 C50.0542;

G94 G00 Z10.0;

X0.0 C30.854;

G01 Z0 F500.0 (Note slow approach, G01);

X0 Y35.2385 (Start position for actual involute);

G93 X25.929 C73.0131 F6.0 (Inv. Time Feedrate, Note G93);

G94 C74.0542;

G94 G00 Z10.0;

X0.0 C54.854;

G01 Z0 F500.0 (Note slow approach, G01);

X0 Y35.2385 (Start position for actual involute);

G93 X25.929 C97.0131 F6.0 (Inv. Time Feedrate, Note G93);

G94 C98.0542;

G94 G00 Z10.0;  
 X0.0 C78.854;  
 G01 Z0 F500.0 (Note slow approach, G01);  
 X0 Y35.2385 (Start position for actual involute);  
 G93 X25.929 C121.0131 F6.0 (Inv. Time Feedrate, Note G93);  
 G94 C122.0542;  
 G94 G00 Z10.0;  
 X0.0 C102.854;  
 G01 Z0 F500.0 (Note slow approach, G01);  
 X0 Y35.2385 (Start position for actual involute);  
 G93 X25.929 C145.0131 F6.0 (Inv. Time Feedrate, Note G93);  
 G94 C146.0542;  
 G94 G00 Z10.0;  
 X0.0 C126.854;  
 G01 Z0 F500.0 (Note slow approach, G01);  
 X0 Y35.2385 (Start position for actual involute);  
 G93 X25.929 C169.0131 F6.0 (Inv. Time Feedrate, Note G93);  
 G94 C170.0542;  
 G94 G00 Z10.0;  
 X0.0 C150.854;  
 G01 Z0 F500.0 (Note slow approach, G01);  
 X0 Y35.2385 (Start position for actual involute);  
 G93 X25.929 C193.0131 F6.0 (Inv. Time Feedrate, Note G93);  
 G94 C194.0542;  
 G94 G00 Z10.0;  
 X0.0 C174.854;  
 G01 Z0 F500.0 (Note slow approach, G01);  
 X0 Y35.2385 (Start position for actual involute);  
 G93 X25.929 C217.0131 F6.0 (Inv. Time Feedrate, Note G93);  
 G94 C218.0542;  
 G94 G00 Z10.0;  
 X0.0 C198.854;  
 G01 Z0 F500.0 (Note slow approach, G01);  
 X0 Y35.2385 (Start position for actual involute);  
 G93 X25.929 C241.0131 F6.0 (Inv. Time Feedrate, Note G93);  
 G94 C242.0542;  
 G94 G00 Z10.0;  
 X0.0 C222.854;  
 G01 Z0 F500.0 (Note slow approach, G01);  
 X0 Y35.2385 (Start position for actual involute);  
 G93 X25.929 C265.0131 F6.0 (Inv. Time Feedrate, Note G93);  
 G94 C266.0542;  
 G94 G00 Z10.0;  
 X0.0 C246.854;  
 G01 Z0 F500.0 (Note slow approach, G01);

X0 Y35.2385 (Start position for actual involute);  
G93 X25.929 C289.0131 F6.0 (Inv. Time Feedrate, Note G93);  
G94 C290.0542;  
G94 G00 Z10.0;  
X0.0 C270.854;  
G01 Z0 F500.0 (Note slow approach, G01);  
X0 Y35.2385 (Start position for actual involute);  
G93 X25.929 C313.0131 F6.0 (Inv. Time Feedrate, Note G93);  
G94 C314.0542;  
G94 G00 Z10.0;  
X0.0 C294.854;  
G01 Z0 F500.0 (Note slow approach, G01);  
X0 Y35.2385 (Start position for actual involute);  
G93 X25.929 C337.0131 F6.0 (Inv. Time Feedrate, Note G93);  
G94 C338.0542;  
G94 G00 Z10.0;  
X0.0 C318.854;  
G01 Z0 F500.0 (Note slow approach, G01);  
X0 Y35.2385 (Start position for actual involute);  
G93 X25.929 C361.0131 F6.0 (Inv. Time Feedrate, Note G93);  
G94 C362.0542;  
G94 G00 Z10.0;  
X0.0 C342.854;  
G01 Z0 F500.0 (Note slow approach, G01);  
X0 Y35.2385 (Start position for actual involute);  
G93 X25.929 C385.0131 F6.0 (Inv. Time Feedrate, Note G93);  
G94 C386.0542;  
G94 G00 Z10.0;

X0.0 C-2.854;  
G01 Z0 F500.0 (Note slow approach, G01);  
X0 Y35.2385 (Start position for actual involute);  
G93 X-25.929 C-46.0131 F6.0 (Inv. Time Feedrate, Note G93);  
G94 C-47.0542;  
G94 G00 Z10.0;  
X0.0 C21.146;  
G01 Z0 F500.0 (Note slow approach, G01);  
X0 Y35.2385 (Start position for actual involute);  
G93 X-25.929 C-22.0131 F6.0 (Inv. Time Feedrate, Note G93);  
G94 C-23.0542;  
G94 G00 Z10.0;  
X0.0 C45.146;  
G01 Z0 F500.0 (Note slow approach, G01);  
X0 Y35.2385 (Start position for actual involute);

G93 X-25.929 C1.9869 F6.0 (Inv. Time Feedrate, Note G93);  
 G94 C0.9458;  
 G94 G00 Z10.0;  
 X0.0 C69.146;  
 G01 Z0 F500.0 (Note slow approach, G01);  
 X0 Y35.2385 (Start position for actual involute);  
 G93 X-25.929 C25.9869 F6.0 (Inv. Time Feedrate, Note G93);  
 G94 C24.9458;  
 G94 G00 Z10.0;  
 X0.0 C93.146;  
 G01 Z0 F500.0 (Note slow approach, G01);  
 X0 Y35.2385 (Start position for actual involute);  
 G93 X-25.929 C49.9869 F6.0 (Inv. Time Feedrate, Note G93);  
 G94 C48.9458;  
 G94 G00 Z10.0;  
 X0.0 C117.146;  
 G01 Z0 F500.0 (Note slow approach, G01);  
 X0 Y35.2385 (Start position for actual involute);  
 G93 X-25.929 C73.9869 F6.0 (Inv. Time Feedrate, Note G93);  
 G94 C72.9458;  
 G94 G00 Z10.0;  
 X0.0 C141.146;  
 G01 Z0 F500.0 (Note slow approach, G01);  
 X0 Y35.2385 (Start position for actual involute);  
 G93 X-25.929 C97.9869 F6.0 (Inv. Time Feedrate, Note G93);  
 G94 C96.9458;  
 G94 G00 Z10.0;  
 X0.0 C165.146;  
 G01 Z0 F500.0 (Note slow approach, G01);  
 X0 Y35.2385 (Start position for actual involute);  
 G93 X-25.929 C121.9869 F6.0 (Inv. Time Feedrate, Note G93);  
 G94 C120.9458;  
 G94 G00 Z10.0;  
 X0.0 C189.146;  
 G01 Z0 F500.0 (Note slow approach, G01);  
 X0 Y35.2385 (Start position for actual involute);  
 G93 X-25.929 C145.9869 F6.0 (Inv. Time Feedrate, Note G93);  
 G94 C144.9458;  
 G94 G00 Z10.0;  
 X0.0 C213.146;  
 G01 Z0 F500.0 (Note slow approach, G01);  
 X0 Y35.2385 (Start position for actual involute);  
 G93 X-25.929 C169.9869 F6.0 (Inv. Time Feedrate, Note G93);  
 G94 C168.9458;  
 G94 G00 Z10.0;

X0.0 C237.146;  
 G01 Z0 F500.0 (Note slow approach, G01);  
 X0 Y35.2385 (Start position for actual involute);  
 G93 X-25.929 C193.9869 F6.0 (Inv. Time Feedrate, Note G93);  
 G94 C192.9458;  
 G94 G00 Z10.0;  
 X0.0 C261.146;  
 G01 Z0 F500.0 (Note slow approach, G01);  
 X0 Y35.2385 (Start position for actual involute);  
 G93 X-25.929 C217.9869 F6.0 (Inv. Time Feedrate, Note G93);  
 G94 C216.9458;  
 G94 G00 Z10.0;  
 X0.0 C285.146;  
 G01 Z0 F500.0 (Note slow approach, G01);  
 X0 Y35.2385 (Start position for actual involute);  
 G93 X-25.929 C241.9869 F6.0 (Inv. Time Feedrate, Note G93);  
 G94 C240.9458;  
 G94 G00 Z10.0;  
 X0.0 C309.146;  
 G01 Z0 F500.0 (Note slow approach, G01);  
 X0 Y35.2385 (Start position for actual involute);  
 G93 X-25.929 C265.9869 F6.0 (Inv. Time Feedrate, Note G93);  
 G94 C264.9458;  
 G94 G00 Z10.0;  
 X0.0 C333.146;  
 G01 Z0 F500.0 (Note slow approach, G01);  
 X0 Y35.2385 (Start position for actual involute);  
 G93 X-25.929 C289.9869 F6.0 (Inv. Time Feedrate, Note G93);  
 G94 C288.9458;  
 G94 G00 Z10.0;

N5 (Finish up);  
 Z0;  
 X0 Y0 C0;  
 M10;  
 M30;  
 %