

FANUC macro program programming

1 . Variable

General workpiece program appoints G code and ship distance with numerical value directly; for example, G01 and X100.0. When user macro is used, numerical value can be appointed directly or by variable. When variable is used, variable value can be changed by program or operation in MDI panel.

#1=#2+100

G01 X#1 F300

illustration :

Variable expression

Variable is permitted by computer, but user macro is not. Variable is appointed by variable number (#) and latter variable number.

For example : #1

Expression can be used to appoint variable number. Here, expression must be closed in bracket.

For example : #[#1+#2-12]

Variable type

Variable can be divided into four types according to variable number .

Variable NO.	Variable type	Function
#0	dummy variable	The variable is always empty, no value is assigned to the variable.
#1-#33	local variable	Local variable is only used to store data in macroprogram, such as operation outcome When power is cut, local variable is initialized to empty. And when macroprogram is called, independent variable assign local variable.
#100-#199 #500-#999	common variable	Common variable has the same meaning in different macro program. when power is cut, variable #100-#199 are initialized to empty. Data of variable #500-#999 is stored even if power is cut.
#1000	system variable	System variable is used to read and write transformation of all kinds of data when CNC is running, such as tool current position and compensation value.

variable value range

Local variable and common variable can have value 0 or values as following shows:

-1047 to -10-29 or -10-2 to -1047

If output oversteps effective range, P/S warning NO.111 is issued.

Decimal omission

When variable value is defined in program, decimal can be ignored.

For example : When define #1 = 123 ; actual value of variable #1 is 123.000.

Variable citation

To use variable value in program, variable number follows it after appointing. when using expression to specify variable, put expression in bracket.

For example : G01X[#1+#2]F#3;

Cited variable value is rounded automatically according to minimum setting unit.

For example :

When G00X# is executed as 1/ 1000mm , CNC assign 123456 to #1, and actual instruction value is G00X12346.

To change the sign of cited variable, put negative sign before #.

For example : G00X - #1

When you cite undefined variable, variable and address are all ignored.

For example : When value of variable #1 is 0 and value of #2 is empty, the executing outcome of G00X#1 Y# 2 is G00X0.

Common variable of double locus(double locus control)

For double locus control, system provides every locus individual macro variable. But, some common variables can use two locus at one time according to the setting of parameter NO.6036 and 6037.

Undefined variable

When variable value is undefined, this variable becomes empty variable. Variable #0 is always empty. And it can not be written but only be read.

Citation

When an undefined variable is cited, address itself is ignored.

When #1=< empty >	When#1=0
G90 X100 Y#1	G90 X100 Y#1

G90 X100	G90 X100 Y0
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(b) Operation

< empty > is the same with 0 except the condition that use < empty > to assign.

when #1=< empty >	when #1=0
#2=#1	#2=#1
#2=< empty >	#2=0
#2=#*5	#2=#*5
#2=0	#2=0
#2=#1+#1	#2=#1+#1
#2=0	#2=0

(c)Condition expression

In EQ and NE < empty > is differ from 0.

when #1=< empty >	When#1=0时
#1EQ#0 true	#1EQ#0 false
#1NE#0 true	#1NE#0 false
#1GE#0 true	#1GE#0 false
#1GT#0 false	#1GT#0 false

Limitation

Program number, sequence number and optional segment jumping number can not use variable.

For example : variable can not be used in below conditions :

O#1 ;

/#2G00X100.0;

N#3Y200.0;

2 . Arithmetic and logic operation

The operations listed below can be executed in variable. expression at the right of operator can include constant and variable composed with function or operator. Variable #j and #k can be assigned by constant. the left variable can be assigned by expression.

Definition	#i=#j
Addition	#i=#j+#k;
Subtraction	#i=#j-#k;
Multiplication	#i=#j*#k;
Division	#i=#j/#k;
Sin	#i=sin[#j];
Arcsine	#i=asin[#j];
Cos	#i=cos[#j];
Arccosine	#i=acos[#j];
Tangent	#i=tan[#j]
Arc tangent	#i=atan[#j]/[#k]
Square root	#i=SQRT[#j];
Absolute value	#i=ABS[#j];
Rounding	#i=ROUNG[#j];
Up rounding	#i=FIX[#j];
Down rounding	#i=FUP[#j];
Natural logarithm	#i=LN[#j];
Exponential function	#i=EXP[#j];
Or	#i=#jOR#k;
Xor	#i=#jXOR#k;
And	#i=#jAND#k;
Change BCD to BIN	#i=BIN[#j];
Change BIN to BCD	#i=BCD[#j];

Angle is appointed with degree. 90o30' denote 90.5 degree.

Logic operation is executed one bit by one bit according to binary number.

Used for handshaking with PMC.

Illustration :

Angle unit

Angle unit of function SIN ,COS,ASIN,ACOS,TAN and ATAN is degree, for example 90° 30' denote 90.5 degree.

ARCSIN # i= ASIN[#j]

(1) Numeric area :

When parameter (NO.6004#0) NAT bit place is set to 0, 270° ~ 90°

When parameter (NO.6004#0) NAT bit place is set to 1, - 90° ~ 90°

(2) When #j overstep the range of - 1 to 1, P/S warning NO.111 is issued.

(3) Variable #j can be replaced by constant.

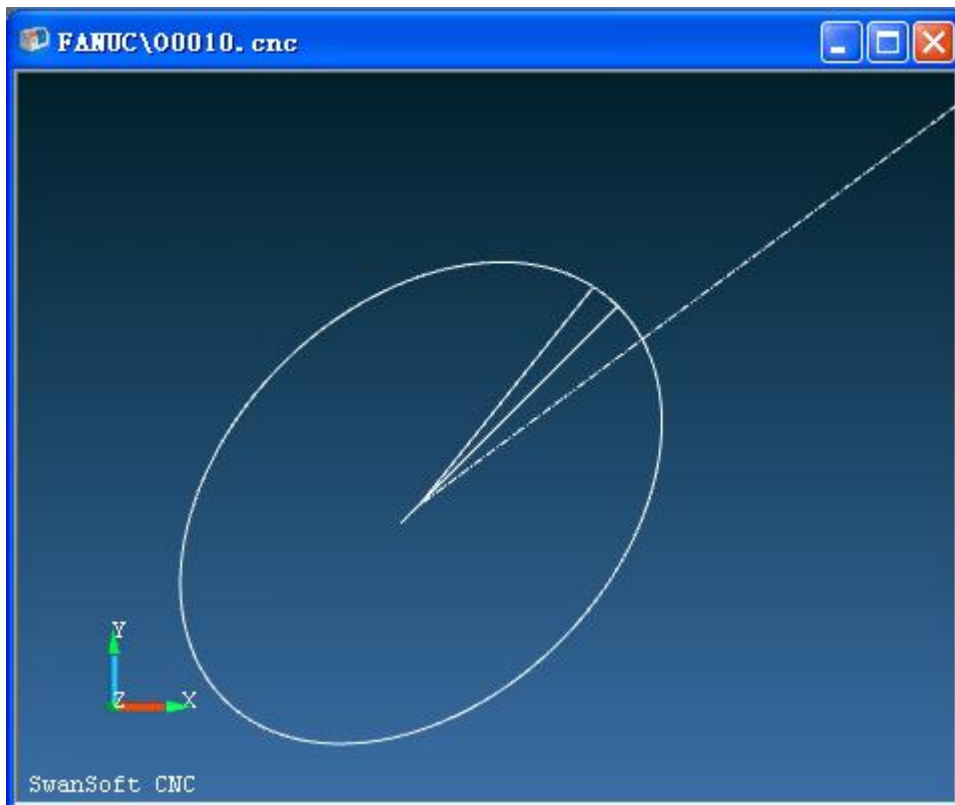
ARCCOS #i=ACOS[#j] numeric area is from 180° to 0° . When #j overstep the range of - 1 to 1, P/S warning NO.111 is issued. Variable #j can be replaced by constant.

3 . Program example

a、 Mill ellipse :



Tool Path for mill ellipse :



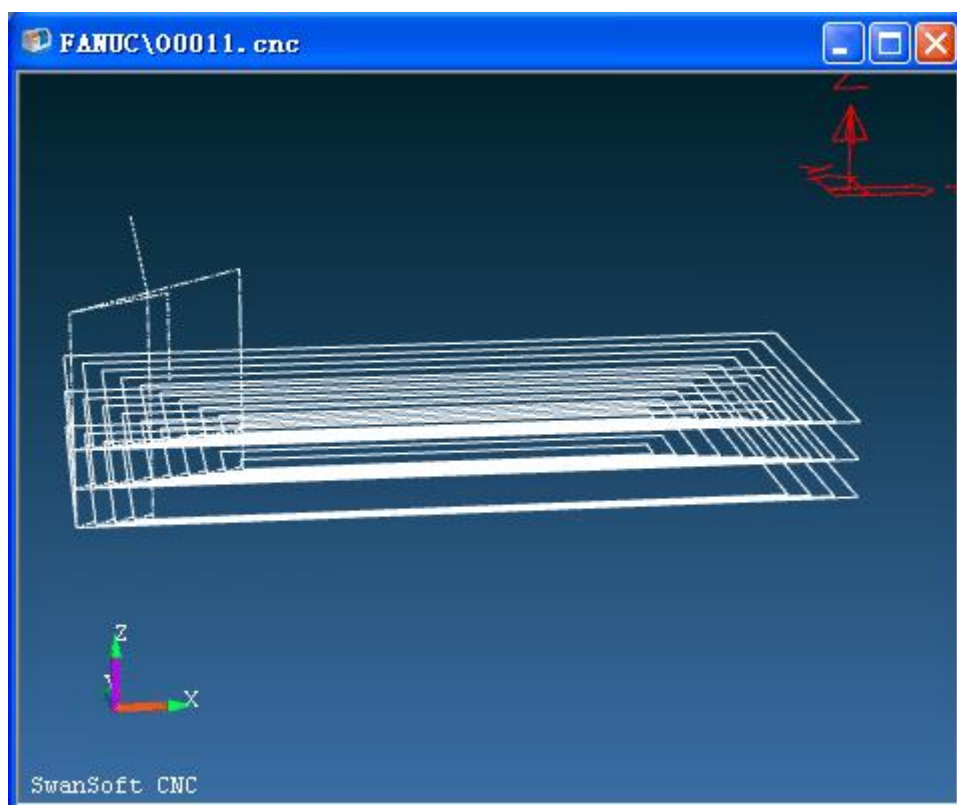
Program code for Mill ellipse :

```
N10 G54 G90 G0 S1500 M03  
N12 X0 Y0 Z20.  
N14 G0 Z1  
N16 G1 Z-5. F150.  
N18 G41 D1  
N20 #1=0  
N22 #2=34  
N24 #3=24  
N26 #4=#2*COS[#1]  
N28 #5=#3*SIN[#1]  
N30 #10=#4*COS[45]-#5*SIN[45]  
N32 #11=#4*SIN[45]+#5*COS[45]  
N34 G1 X#10 Y#11  
N36 #1=#1+1  
N38 IF [#1 LT 370] GOTO26  
N40 G40 G1 X0 Y0  
N42 G0 Z100  
N44 M30
```

b、 Mill rectangular channel :



Tool Path for mill rectangular channel :



Code for milling rectangular channel :

```
#102=0.
```

```
N3#100=0.
```

```
#101=0.
```

#103=200.

#104=400.

G91G28Z0.

G0G90G54X0.Y0.

G43H1Z20.

M3S2000.

N4G0X#100Y#101

G01Z#102F200.

#102=#102-2.

IF[#102EQ-50.]GOTO1

GOTO2

N2

N4X#104F500.

Y#103

X#100

Y#101

#100=#100+10.

#101=#101+10.

#103=#103-10.

#104=#104-10.

IF[#100EQ100.]GOTO3

GOTO4

N3

N1

M5

M9

G91G28Z0.

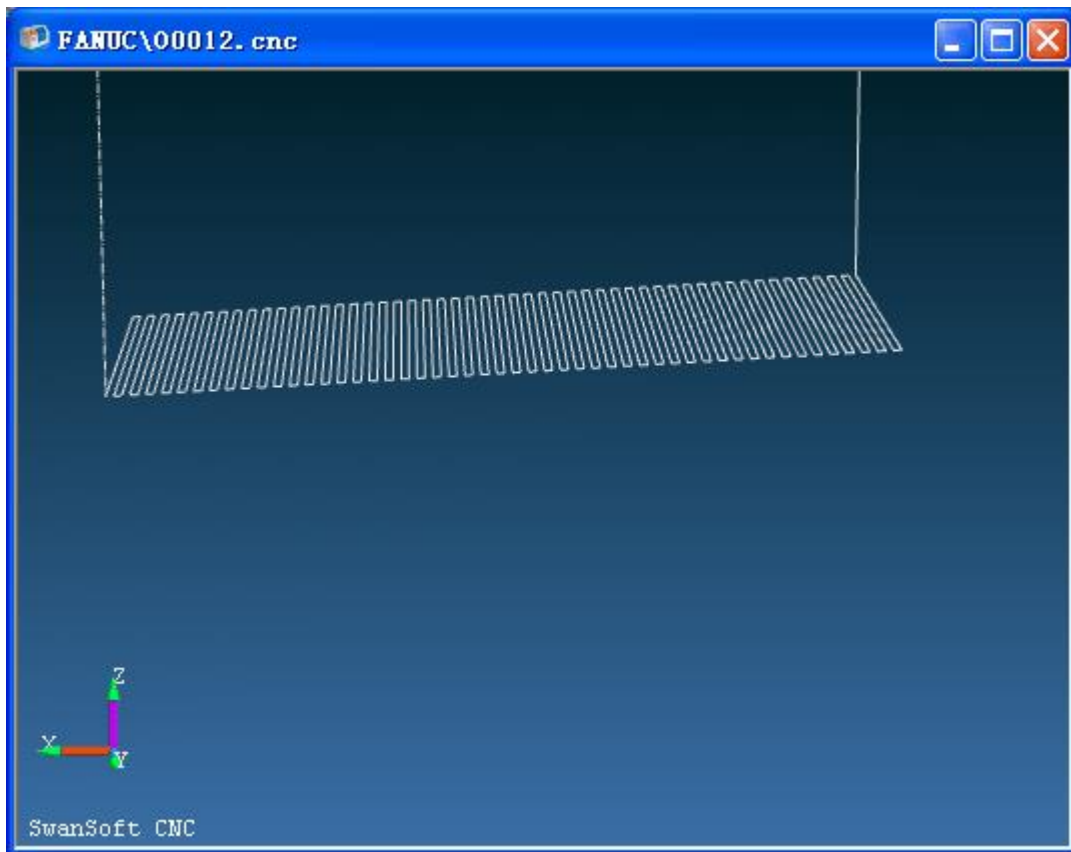
G28Y0.

M30

c、Mill surface inclining to 3 degree :



Tool Path for mill surface inclining to 3 degree :



Code for milling surface inclining to 3 degree :

```
O0001
#[#1+1*2]=1
G65P9012L1A0B0.1C4I100J3K0
M30
```

Macro O9012 code :

```
G54 G90 G00 X[#3] Y0 Z100
S500 M3
G01 Z0 F300
WHILE[#1LE10]DO1
#7= #1/TAN[#5]+#3
G1Z-#1 X#7
#8=#6/2-ROUND[#6/2]
```

IF[#8EQ0]GOTO10

G1Y0

GOTO20

N10 Y#4

N20#1=#1+#2

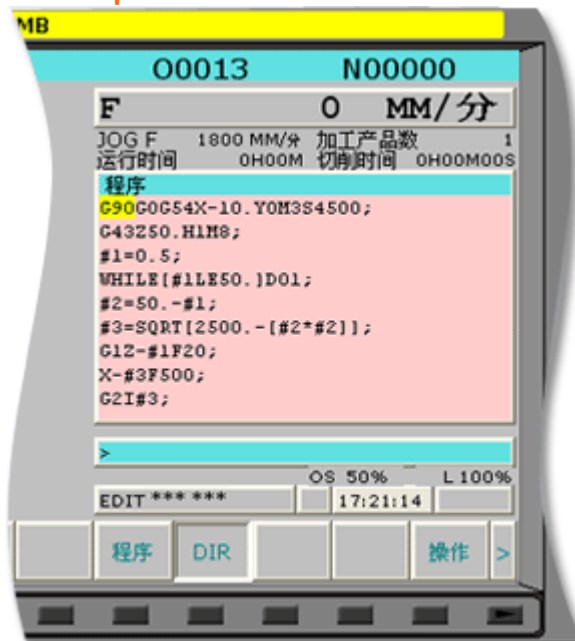
#6=#6+1

END1

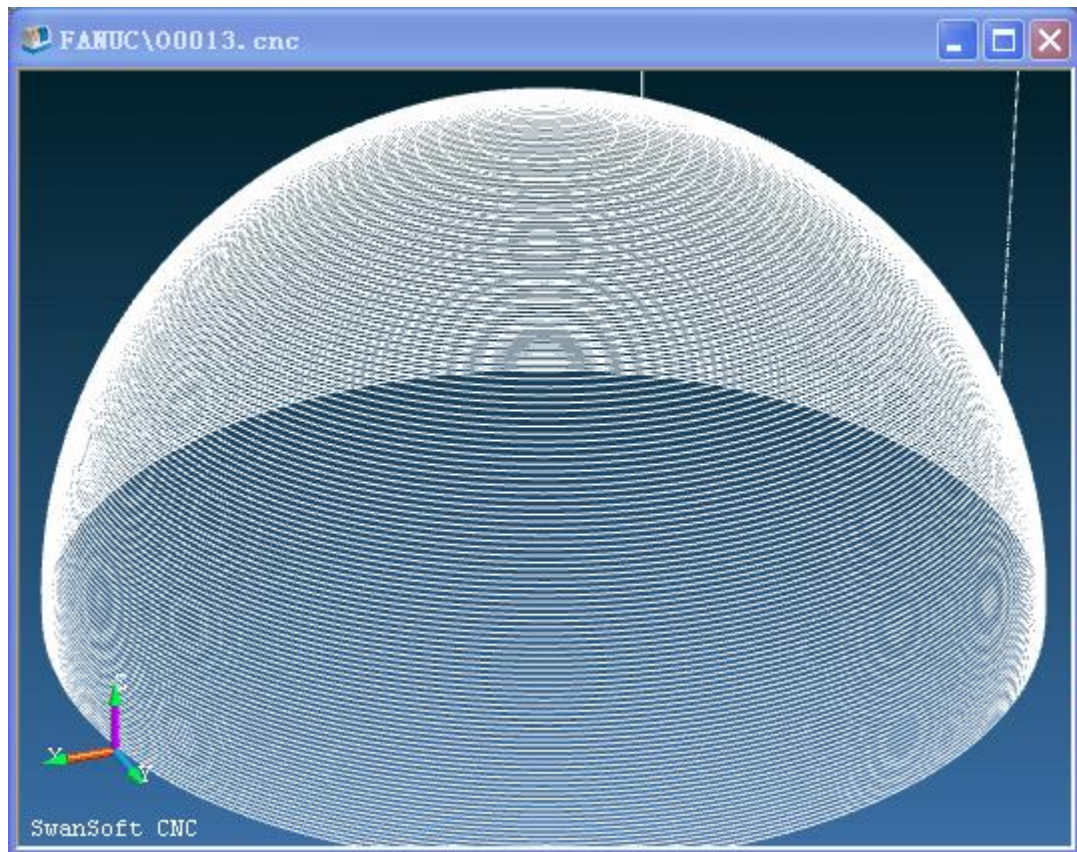
GO

Z100

d、 Mill semisphere :



Tool Path for mill semisphere :



Code for milling semisphere :

```
G90G0G54X-10.Y0M3S4500
```

```
G43Z50.H1M8
```

```
#1=0.5
```

```
WHILE[#1LE50.]DO1
```

```
#2=50.-#1
```

```
#3=SQRT[2500.-[#2*#2]]
```

```
G1Z-#1F20
```

```
X-#3F500
```

```
G2I#3
```

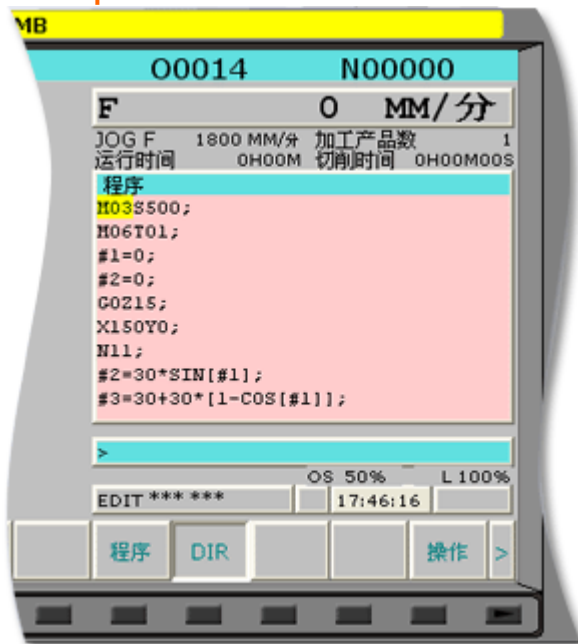
```
#1=#1+0.5
```

```
END1
```

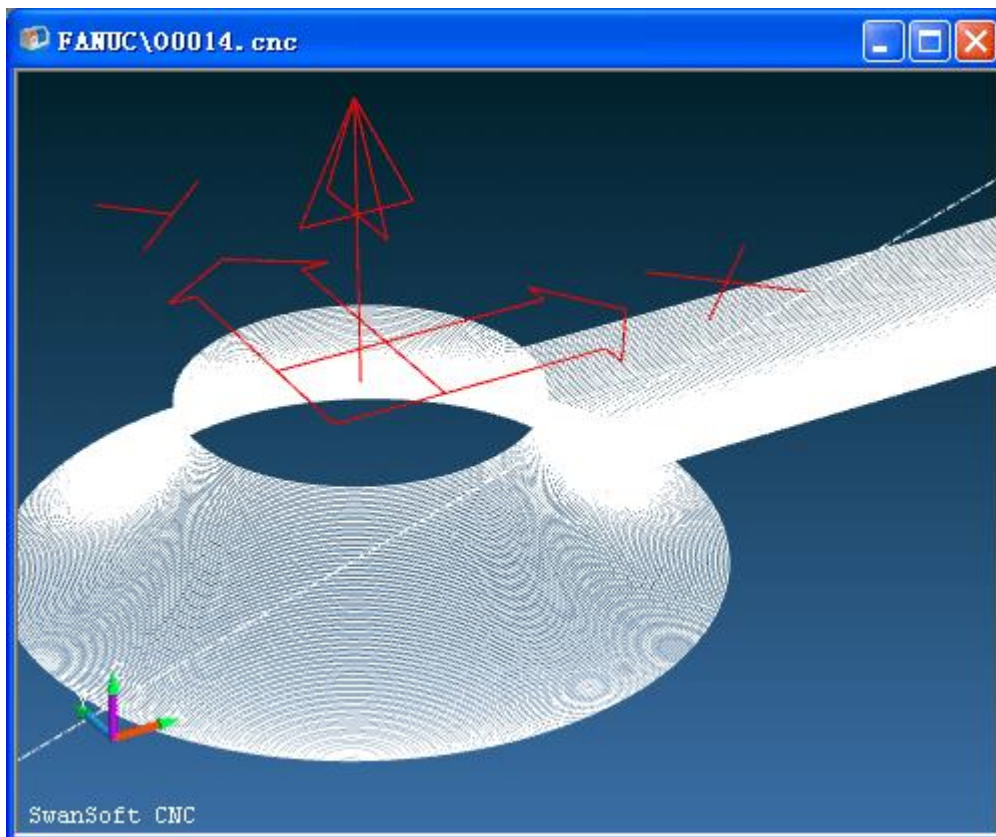
```
G0Z50.M5
```

M30

e、Mill trumpet :



Tool Path for mill trumpet :



Code for milling trumpet :

M03 S500

```
M06 T01

#1=0

#2=0

G0 Z15

X150 Y0

N11

#2=30*SIN[#1]

#3=30+30*[1-COS[#1]]

G01 Z-#2 F40

G41 X#3 D01

G03 I-#3

G40 G01 X150 Y0

#1=#1+1

IF [#1 LE 90] GOTO 11

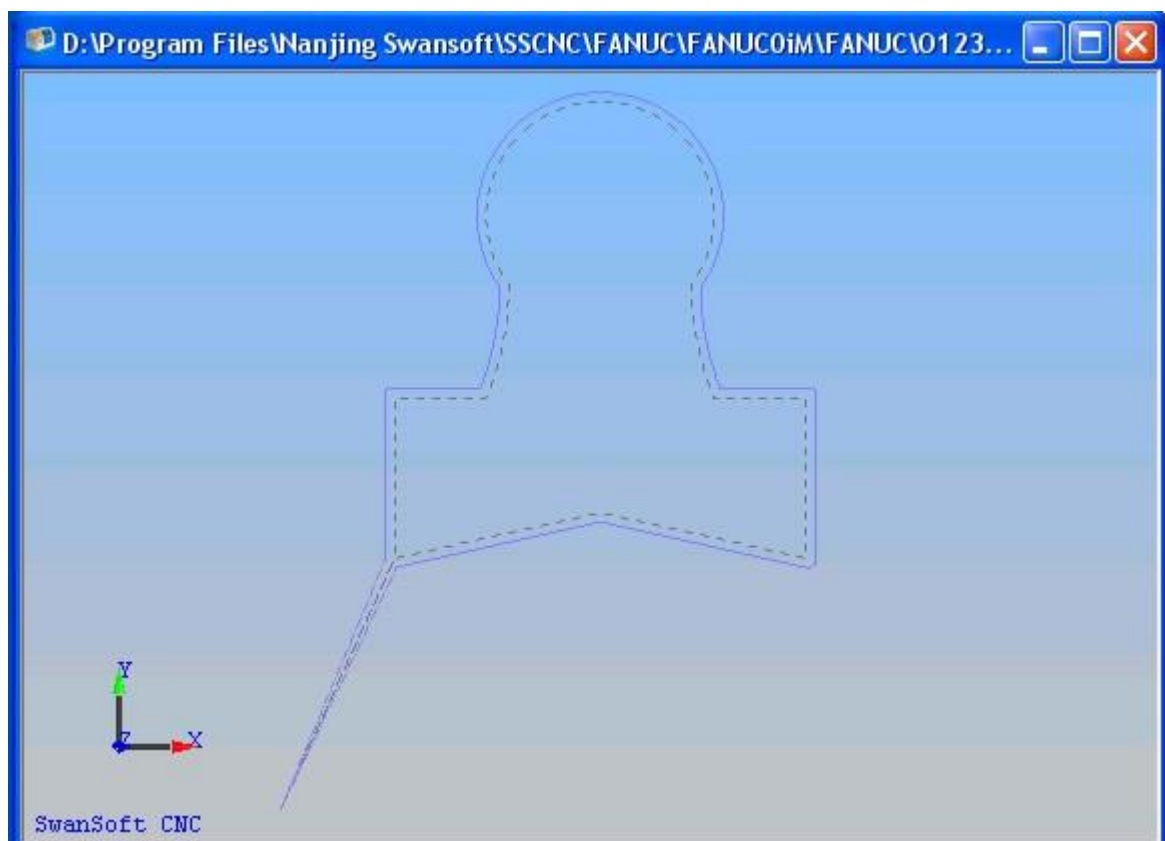
G0 Z30

M30
```

f、FANUC Tool compensation system parameter macro application



Tool Path for tool compensation :



Code for tool compensation

O1234

#12007=4

G92X0Y0Z0

N1G90G17G00G41D07X25.0Y55.0

N2G01Y90.0F150

N3X45.0

N4G03X50.0Y115.0R65.0

N5G02X90.0R-25.0

N6G03X95.0Y90.0R65.0

N7G01X115.0

N8Y55.0

N9X70.0Y65.0

N10X25.0Y55.0

N11G00G40X0Y0