

精湛的技術 傑出的產品

大立機器工業股份有限公司

DAH LIH MACHINERY INDUSTRY CO., LTD.

CUSTOM MACRO PROGRAMMING MANUAL

誠信踏實

FS-0M
FS-18M
FS-15M
FS-18i/21iMB
FS-0iMC/0iMD

MELDAS-M520

永續經營

R3-T23-014 VERSION : 1.0

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THE EXPLAIN OF MACRO:

I .HOLE PATTERN

1. Line angle drilling
G65P9911X_Y_U_A_H_
2. Square grid drilling
G65P9912X_Y_U_V_H_M_A_
3. Square outside drilling
G65P9913X_Y_U_V_H_M_A_
4. Circle outside drilling
G65P9914X_Y_I_H_A_
5. Arc drilling
G65P9915X_Y_I_H_D_A_

II .FACING CUTTING

1. Square UNI DIR milling
G65P9921X_Y_Z_R_U_V_D_F_E_C_K_Q_
2. Square BI DIR milling
G65P9922X_Y_Z_R_U_V_D_F_E_C_K_Q_
3. Circle facing milling
G65P9923X_Y_Z_R_I_D_F_E_C_K_Q_

III .SIDE CUTTING

1. Finish cutting outside of circle
G65P9931X_Y_Z_R_I_D_F_C_M_
2. Finish cutting inside of circle
G65P9932X_Y_Z_R_I_D_F_C_S_M_
3. Finish cutting outside of square
G65P9933X_Y_Z_R_I_D_F_U_V_C_S_M_
4. Finish cutting inside of square
G65P9934X_Y_Z_R_I_D_F_U_V_C_S_M_
5. Finish cutting outside of track
G65P9935X_Y_Z_R_I_J_U_D_F_C_M_

6. Finish cutting inside of track

G65P9936X_Y_Z_R_I_J_U_D_F_C_S_M_

IV. POCKETING

1. Bevel circle pocket

G65P9941X_Y_Z_R_H_I_D_F_Q_E_A_C_K_S_M_T_(W620)

2. Bevel square pocket

G65P9942X_Y_Z_R_H_U_V_I_J_D_F_Q_E_A_B_C_K_S_M_T_
(W620)

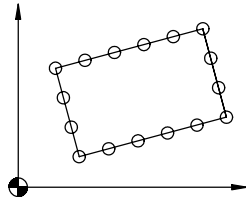
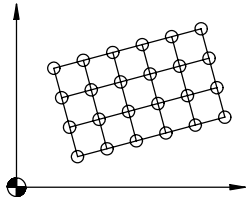
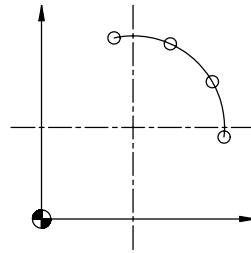
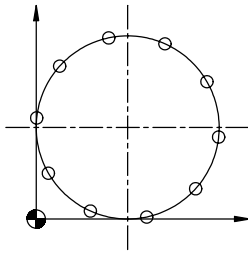
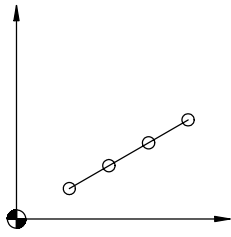
3. Track pocket

G65P9943X_Y_Z_R_H_I_J_U_D_F_Q_E_C_K_S_M_

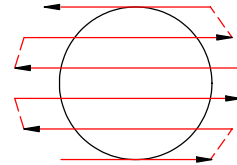
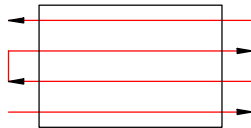
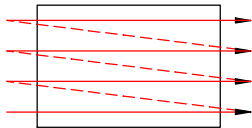
Note : The decimal can not be omitted for these commands A, C, I, J, K, Q, R, X, Y,

Z °

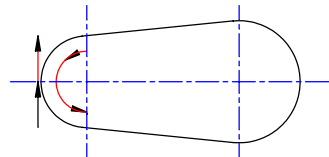
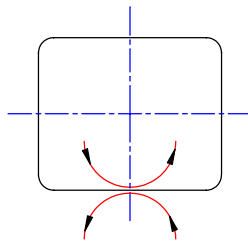
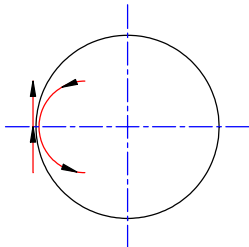
HOLE PATTERN



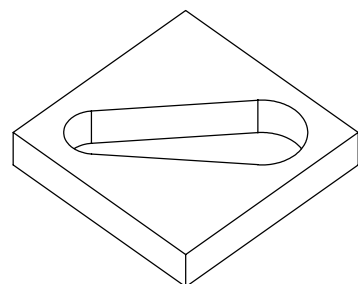
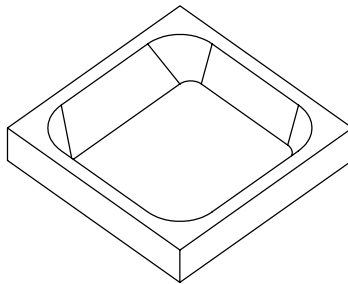
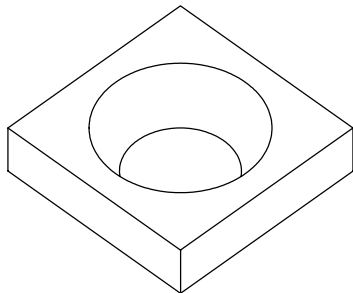
FACING



SIDE CUTTING



POCKETING

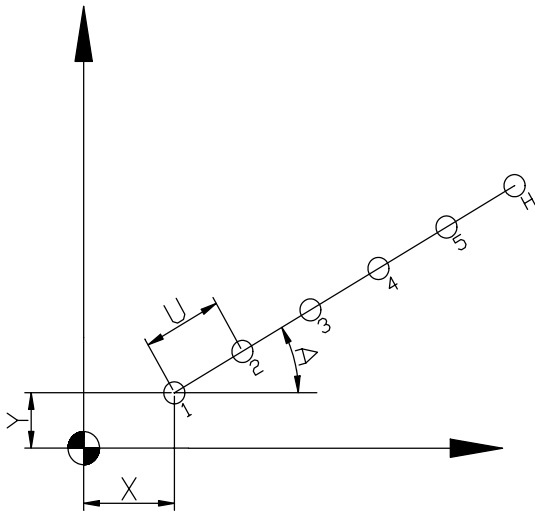


警訊一覽表(ALARM LIST)：

訊息 (MESSAGE)	詳述 (Specification)
AL 3081 數據缺乏或錯誤 DATA LACK OR ERROR	檢查下列指令是否遺漏或錯誤 (I.J.D.F.U.V.C.H.M.). Check whether any command be omitted or wrong , for example (I.J.D.F.U.V.C.H.M.).
AL 3082 補償錯誤 OFFSET ERROR	不正確的"刀具半徑補正值"被指令. Incorrect <u>offset value</u> be specified for the cutter.
AL 3083 指令 C 數據錯誤 DATA ERROR FOR C.	不正確的"切入圓弧半徑 C"被指令. Incorrect <u>radius of the approach circle</u> be specified , for example C.
AL 3084 快速接近點 R 錯誤或未指令 RAPID APPROACH POINT R ERROR	未指令"切削接近點 R"或指令值錯誤. Nothing be specified for <u>rapid approach point R</u> , or the specified value is wrong.
AL 3085 Z 軸終點指令錯誤或未指令 Z END POINT ERROR	未指令"終點切削深度 Z"或指令值錯誤 Nothing be specified for <u>bottom point Z</u> , or the specified value is wrong.
AL 3086 轉角圓弧半徑 I 錯誤 CORNER RADIUS I ERROR	不正確的"轉角圓弧半徑"被指令 Incorrect <u>corner arc radius</u> be specified.
AL 3087 修改指令值 E MODIFY E.	不正確的"有效刀徑切削寬度百分比"被指令.E 值必須不大於 1.0. Incorrect <u>percentage of the available cutting width</u> be specified. The value E can't be greater than 1.0.
AL 3088 修改指令值 Q MODIFY Q.	不正確的"分層切削深度"被指令.Q 值必須不大於 (R-Z)之值. Incorrect <u>pass depth</u> be specified .and the value Q can't be greater than the value(R-Z).
AL 3089 修改指令值 K MODIFY K.	不正確的"精加工裕度"被指令.K 值必須不大於 Q 之值. Incorrect <u>finish stock allowance</u> be specified. The value K can't be greater than the value Q.

訊息 (MESSAGE)	詳述 (Specification)
AL 3090 R.H.Z.順序錯誤 SEQUENCE-ERROR-R.H.Z.	R.H.Z.的順序應遵守 $R. \geq H. \geq Z.$ The relation for R.H.Z. must obey the rule of sequence, The rule is $R. \geq H. \geq Z.$
AL 3091 H.指令遺漏 DATA-LACK-H.	檢查 H.指令是否遺漏. Check whether command H. be omitted.
AL 3092 角度 A.指令值太大 BEVEL-A-TOO-BIG	過大的斜角 A.被指令. The value A. is too big.
AL 3093 角度 B.指令值太大 BEVEL-B-TOO-BIG	過大的斜角 B.被指令. The value B. is too big.
AL 3094 轉角過切 OVERCUTTING-IN-CORNER	轉角過切將發生,檢查相關指令 A.B.H.Z.I.J.的設定值. Overcutting occur in corner arc. Check the relative values for A.B.H.Z.I.J.

(1) Line(線上點) O9911



G81-G89(CANNED CYCLE)K0(L0)

G65P9911X_Y_U_A_H_

Argument	Meaning	If omitted
X	Absolute coordination of first hole	According to previous point
Y	Absolute coordination of first hole	According to previous point
U	Distance between holes on the line	Alarm 3081
A	Rotational angle formed by line and X-axis	A=0
H	Number of holes on the line	Alarm 3081

Note :

K : 18M,15M,M520

L : 0M

} Number of repeats

Example : Line angle drilling

Ø6.8 mm Drill

Spindle speed 1764 rpm

Feedrate 176 mm/min

Cutting depth 15 mm

Z axis start point 50.0 mm above workpiece

Program : %

O1225

G40G49G80

G00G90G54X0Y0

G43H01Z50.M3S1764

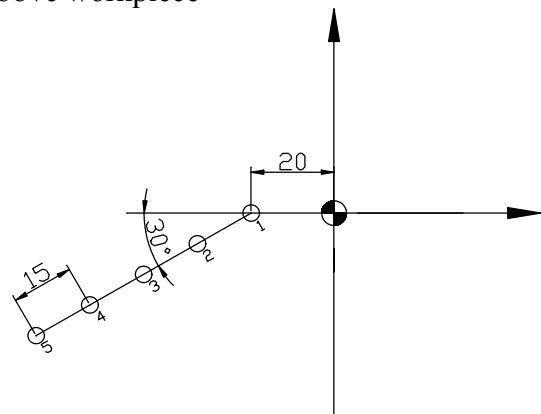
G81Z-15.R5.F176K0(L0)

G65P9911X-20.0Y0.0U-15.0A30.0H5.

G80G91G28Z0

M30

%



Note :1.The value U can be minus.

2.The value H must larger than 0 and be positive integer.

3.The rotational angle A , plus direction of the angle is counterclockwise , and the minus direction is the clockwise , the center of rotation is first center of hole .

4.The G65 code is effective only in the block in which it is specified .

%

O9911(LINE-AT-ANGLE)

(G65P9911X-Y-U-A-H-)

#31=#4001

#33=#4003

#32=#5003

IF[#24EQ#0]GOTO10

GOTO20

N10#24=#5001

N20IF[#25EQ#0]GOTO30

GOTO40

N30#25=#5002

N40IF[[#21*#11]EQ0]GOTO990

#12=FIX[#11]

IF[[#11-#12]NE0]GOTO990

IF[#11LT0]GOTO990

IF[#1EQ#0]GOTO50

GOTO60

N50#1=0

N60#1=-#1

#100=1

WHILE[#100LE#11]DO1

#27=[#100-1]*#21

#28=0

X[#27*COS[#1]+#28*SIN[#1]+#24]Y[#28*COS[#1]-#27*SIN[#1]+#25]

#100=#100+1

END1

G#31G#33F#9

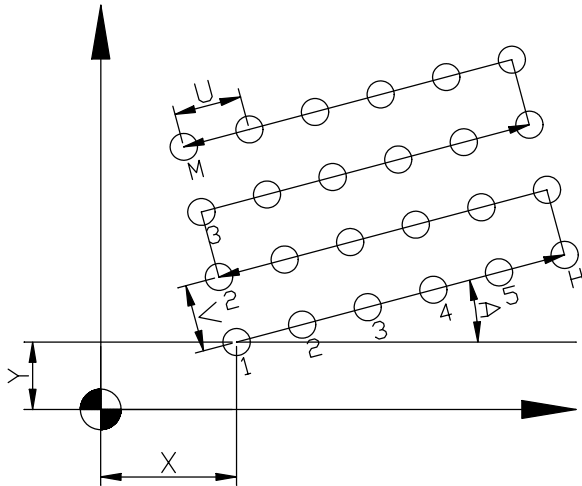
GOTO999

N990#3000=81(DATA-LACK-OR-ERROR-U.H.)

N999M99

%

(2) Grid(網格點) O9912



G81-G89(CANNED CYCLE)K0(L0)

G65P9912X_Y_U_V_H_M_A_)

Argument	Meaning	If omitted
X	Absolute coordination of first hole	According to previous point
Y	Absolute coordination of first hole	According to previous point
U	Distance between holes on the line	Alarm 3081
V	Distance between holes on the column	Alarm 3081
A	Rotational angle formed by line and X-axis	A=0
H	Number of holes on the line	Alarm 3081
M	Number of holes on the column	Alarm 3081

Note :

K : 18M,15M,M520

L : 0M

} Number of repeats

Example : Square grid drilling

Ø6.8 mm Drill

Spindle speed 1764 rpm

Feedrate 176 mm/min

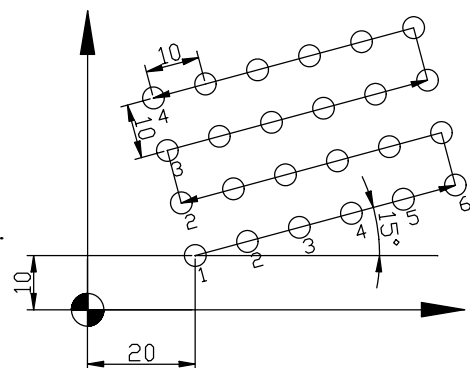
Cutting depth 15 mm

Z axis start point 50.0 mm above workpiece

Program : %

```

O1225
G40G49G80
G00G90G54X0Y0
G43H01Z50.M3S1764
G81Z-15.R5.F176K0(L0)
G65P9912X20.0Y10.0U10.0V10.0A15.0H6.M4.
G80G91G28Z0
M30
%
```



Note :1.The value U and V can be minus.

2.The value H and M must be larger than 0 and be positive integer.

If H,M equal to 1 , the value U and V can be omitted.

3.The rotational angle A , plus direction of the angle is counterclockwise , and the minus direction is the clockwise , the center of rotation is first center of hole .

4.The G65 code is effective only in the block in which it is specified .

%

O9912(GRID)

(G65P9912X-Y-U-V-H-M-A-)

#31=#4001

#33=#4003

#32=#5003

IF[#24EQ#0]GOTO10

GOTO20

N10#24=#5001

N20IF[#24EQ#0]GOTO30

GOTO40

N30#25=#5002

N40IF[[#11*#13]EQ0]GOTO990

IF[#1EQ#0]GOTO50

GOTO60

N50#1=0

N60#1=-#1

#12=FIX[#11]

#14=FIX[#13]

IF[[#11-#12]NE0]GOTO990

IF[[#13-#14]NE0]GOTO990

IF[#11GT1]GOTO70

GOTO80

N70IF[#21EQ#0]GOTO990

N80IF[#13GT1]GOTO90

GOTO100

N90IF[#22EQ#0]GOTO990

N100 #101=1

WHILE[#101LE#13]DO2

N200#100=1

WHILE[#100LE#11]DO1

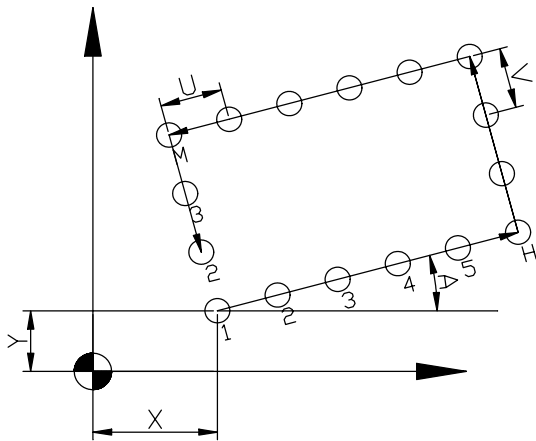
#27=[#100-1]*#21

#28=[#101-1]*#22

```

X[#27*COS[#1]+#28*SIN[#1]+#24]Y[#28*COS[#1]-#27*SIN[#1]+#25]
#100=#100+1
END1
N300#100=#11
WHILE[#100GE1]DO1
#27=[#100-1]*#21
#28=#101*#22
#109=[#13-1]*#22
IF[ABS[#28]GTABS[#109]]GOTO400
X[#27*COS[#1]+#28*SIN[#1]+#24]Y[#28*COS[#1]-#27*SIN[#1]+#25]
#100=#100-1
END1
N400#101=#101+2
END2
G#31G#33F#9
GOTO999
N990#3000=81(DATA-LACK-OR-ERROR-U.V.H.M)
N999M99
%
```

(3) Square(方格點) O9913



G81-G89(CANNED CYCLE)K0(L0)

G65P9913X_Y_U_V_H_M_A_)

Argument	Meaning	If omitted
X	Absolute coordination of first hole	According to previous point
Y	Absolute coordination of first hole	According to previous point
U	Distance between holes on the line	Alarm 3081
V	Distance between holes on the column	Alarm 3081
A	Rotational angle formed by line and X-axis	A=0
H	Number of holes on the line	Alarm 3081
M	Number of holes on the column	Alarm 3081

Note :

K : 18M,15M,M520

L : 0M

} Number of repeats

Example : Square outside drilling

Ø6.8 mm Drill

Spindle speed 1764 rpm

Feedrate 176 mm/min

Cutting depth 15 mm

Z axis start point 50.0 mm above workpiece

Program : %

O1225

G40G49G80

G00G90G54X0Y0

G43H01Z50.M3S1764

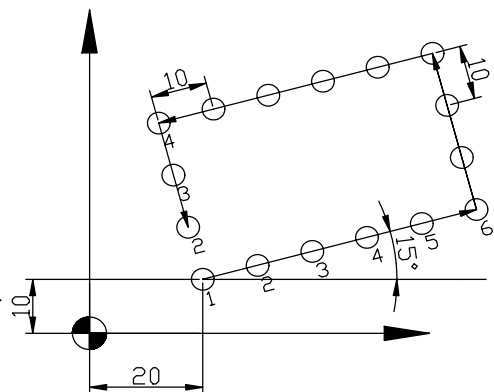
G81Z-15.R5.F176K0(L0)

G65P9913X20.0Y10.0U10.0V10.0A15.0H6.M4.

G80G91G28Z0

M30

%



Note :1.The value U and V can be minus.

2.The value H and M must be larger than 0 and be positive integer.

If H,M equal to 1 , the value U and V can be omitted.

3.The rotational angle A , plus direction of the angle is counterclockwise , and the minus direction is the clockwise , the center of rotation is first center of hole .

4.The G65 code is effective only in the block in which it is specified .

%

O9913(SQUARE)

(G65P9913X-Y-U-V-H-M-A-)

#31=#4001

#33=#4003

#32=#5003

IF[#24EQ#0]GOTO10

GOTO20

N10#24=#5001

N20IF[#24EQ#0]GOTO30

GOTO40

N30#25=#5002

N40IF[[#11*#13]EQ0]GOTO990

IF[#1EQ#0]GOTO50

GOTO60

N50#1=0

N60#1=-#1

#12=FIX[#11]

#14=FIX[#13]

IF[[#11-#12]NE0]GOTO990

IF[[#13-#14]NE0]GOTO990

IF[#11GT1]GOTO70

GOTO80

N70IF[#21EQ#0]GOTO990

N80IF[#13GT1]GOTO90

GOTO100

N90IF[#22EQ#0]GOTO990

N100#100=1

WHILE[#100LE#11]DO1

#27=[#100-1]*#21

#28=0

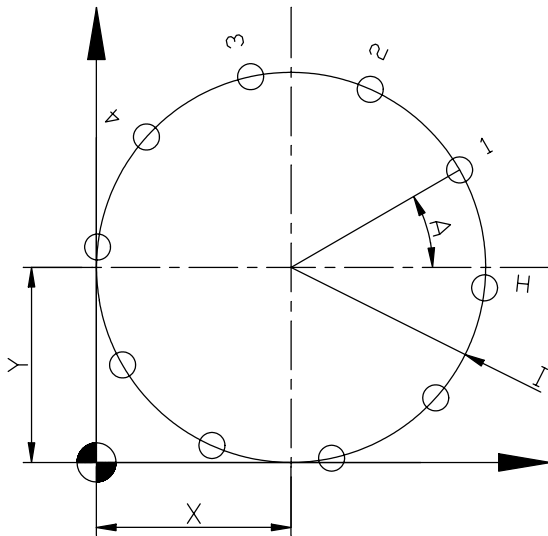
X[#27*COS[#1]+#28*SIN[#1]+#24]Y[#28*COS[#1]-#27*SIN[#1]+#25]

#100=#100+1

```

END1
N200#100=2
WHILE[#100LE#13]DO1
#27=[#11-1]*#21
#28=[#100-1]*#22
X[#27*COS[#1]+#28*SIN[#1]+#24]Y[#28*COS[#1]-#27*SIN[#1]+#25]
#100=#100+1
END1
N300#100=#11-1
WHILE[#100GE1]DO1
#27=[#100-1]*#21
#28=[#13-1]*#22
X[#27*COS[#1]+#28*SIN[#1]+#24]Y[#28*COS[#1]-#27*SIN[#1]+#25]
#100=#100-1
END1
N400#100=#13-1
WHILE[#100GE2]DO1
#27=0
#28=[#100-1]*#22
X[#27*COS[#1]+#28*SIN[#1]+#24]Y[#28*COS[#1]-#27*SIN[#1]+#25]
#100=#100-1
END1
G#31G#33F#9
GOTO999
N990#3000=81(DATA-LACK-OR-ERROR-U.V.H.M)
N999M99
%
```

(4) Circle(圓周點) O9914



G81-G89(CANNED CYCLE)K0(L0)

G65P9914X_Y_I_H_A_

Argument	Meaning	If omitted
X	Absolute coordination of circle center	According to previous point
Y	Absolute coordination of circle center	According to previous point
I	Cutting circle radius	Alarm 3081
A	Angle formed by the first hole and X-axis	A=0
H	Number of holes on the line	Alarm 3081

Note :

K : 18M,15M,M520

L : 0M

} Number of repeats

Example : Circle outside drilling

Ø6.8 mm Drill

Spindle speed 1764 rpm

Feedrate 176 mm/min

Cutting depth 15 mm

Z axis start point 50.0 mm above workpiece

Program : %

O1225

G40G49G80

G00G90G54X0Y0

G43H01Z50.M3S1764

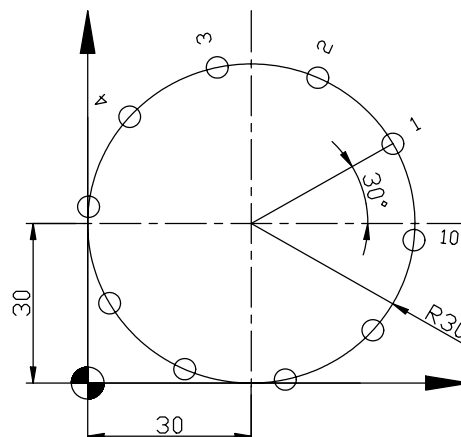
G81Z-15.R5.F176K0(L0)

G65P9914X30.0Y30.0I30.0H10.A30.0

G80G91G28Z0

M30

%



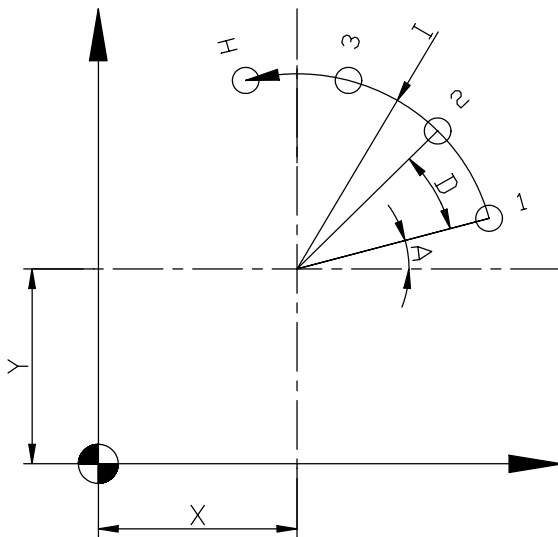
- Note :1.The value H must be larger than 0 and be positive integer.
 2.The value A , plus direction of the angle is counterclockwise , and the minus direction is the clockwise .
 3.The G65 code is effective only in the block in which it is specified .

%

```
O9914(BOLT HOLE CIRCLE)
(G65P9914X-Y-I-H-A-)
#31=#4001
#33=#4003
#32=#5003
IF[#24EQ#0]GOTO10
GOTO20
N10#24=#5001
N20IF[#24EQ#0]GOTO30
GOTO40
N30#25=#5002
N40IF[#1EQ#0]GOTO50
GOTO60
N50#1=0
N60IF[ [#11*#4]EQ0]GOTO990
#12=FIX[#11]
IF[ [#12-#11]NE0]GOTO990
#14=360/#11
#100=1
WHILE[#100LE#11]DO1
#15=#1+[ #100-1 ]*#14
#27=#4*COS[#15]+#24
#28=#4*SIN[#15]+#25
X#27Y#28
#100=#100+1
END1
G#31G#33F#9
GOTO999
N990#3000=81(DATA-LACK-OR-ERROR-I.H.)
N999M99
```

%

(5) Arc(圓弧點) O9915



G81-G89(CANNED CYCLE)K0(L0)

G65P9915X_Y_I_H_D_A_

Argument	Meaning	If omitted
X	Absolute coordination of arc center	According to previous point
Y	Absolute coordination of arc center	According to previous point
I	Radius of arc	Alarm 3081
D	Angular distance between holes	Alarm 3081
A	Angle formed by the first hole and X-axis	A=0
H	Number of holes on the line	Alarm 3081

Note :

K : 18M,15M,M520

L : 0M

} Number of repeats

Example : Arc drilling

Ø6.8 mm Drill

Spindle speed 1764 rpm

Feedrate 176 mm/min

Cutting depth 15 mm

Z axis start point 50.0 mm above workpiece

Program : %

O1225

G40G49G80

G00G90G54X0Y0

G43H01Z50.M3S1764

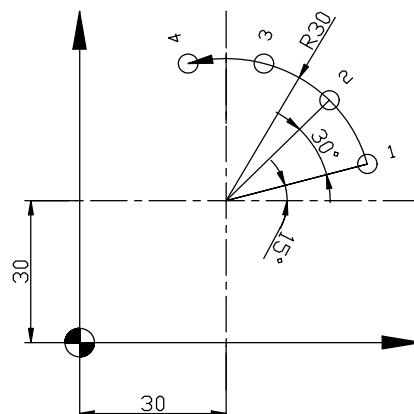
G81Z-15.R5.F176K0(L0)

G65P9915X30.0Y30.0I30.0H4.D30.A15.0

G80G91G28Z0

M30

%

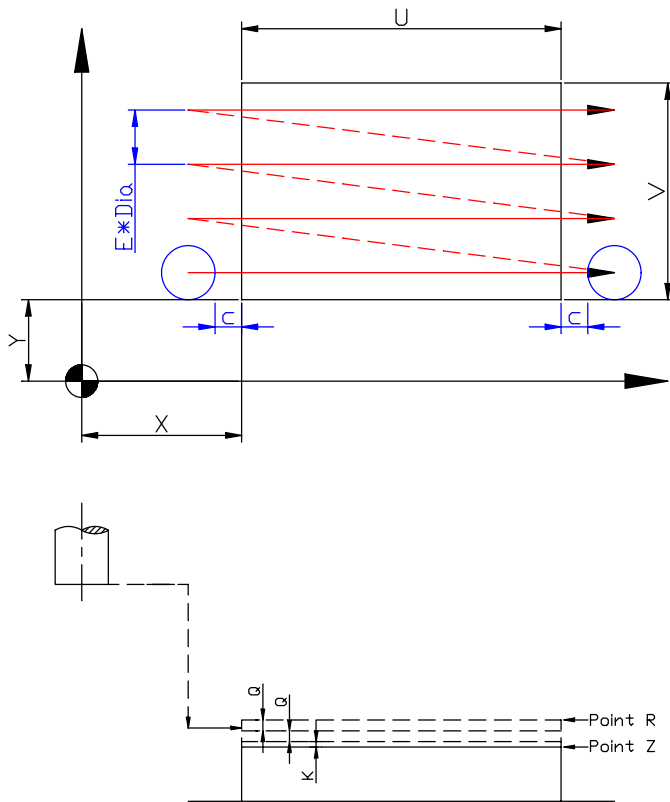


- Note :
1. The value H must be larger than 0 and be positive integer.
 2. The value A , plus direction of the angle is counterclockwise , and the minus direction is the clockwise.
 3. The G65 code is effective only in the block in which it is specified .
 4. The product (between angular difference (D) and number of holes(h)) must be 360 or less.
 5. The value D can be minus.

```

%
O9915(ARC)
(G65P9915X-Y-I-D-H-A-)
#31=#4001
#33=#4003
#32=#5003
IF[#24EQ#0]GOTO10
GOTO20
N10#24=#5001
N20IF[#24EQ#0]GOTO30
GOTO40
N30#25=#5002
N40IF[#1EQ#0]GOTO50
GOTO60
N50#1=0
N60IF[ [#11*#4*#7]EQ0]GOTO990
#12=FIX[#11]
IF[ [#12-#11]NE0]GOTO990
IF[ABS[#7*#11]GT360]GOTO990
#100=1
WHILE[#100LE#11]DO1
#15=#1+[ #100-1 ]*#7
#27=#4*COS[#15]+#24
#28=#4*SIN[#15]+#25
X#27Y#28
#100=#100+1
END1
G#31G#33F#9
GOTO999
N990#3000=81(DATA-LACK-OR-ERROR-I.D.H.)
N999M99
%
```

(6) SQUARE UNI DIR(四方形同向面銑) O9921

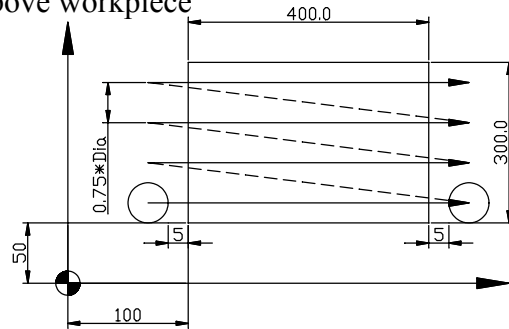


G65P9921(X_Y_Z_R_U_V_D_F_E_C_K_Q_)

Argument	Meaning	If omitted
X	Absolute coordination of the left down point	According to previous point
Y	Absolute coordination of the left down point	According to previous point
Z	Finish depth	Alarm 3085
R	Starting depth and rapid approach point	Alarm 3084
U	Horizontal side length	Alarm 3081
V	Longitudinal side length	Alarm 3081
D	Cutter radius offset NO.	Alarm 3081
F	Feedrate	Alarm 3081
E	The percentage of the effectual cutting width ($E \leq 1$)	$E=0.60$
C	Clearance	$C = \text{Radius of cutter}$
K	Finish stock allowance	$K=0$
Q	Pass depth	$Q=R-Z+K$

Example : Square UNI DIR milling

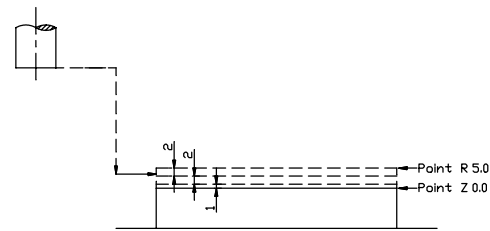
Ø75.0mm Face mill D02=37.5
 Spindle speed 600 rpm
 Feedrate 720 mm/min
 Cutting 5 mm
 Pass rough machining depth 2.0 mm
 Finish stock allowance 1.0 mm
 Z axis start point 50 mm above workpiece
 Star cutting point R5.0
 Finish cutting point Z0.0



Program : %

```

O1225
G40G49G80
G00G90G54X0Y0
G43H01Z50.M3S600
G65P9921X100.0Y50.0Z0.0R5.0U400.0V300.0D02F720E0.75C5.0K1.0Q2.0
G80G91G28Z0
M30
%
```



Note :1.The command (G65P9921) include the finishing cutting.

- 2.The value U and V must be larger than 0 , otherwise ALARM 3081 will occur.
- 3.The percentage of effectual cutting width E can not be larger than 1.0 , otherwise ALARM 3087 will occur.
- 4.The clearance C can not be less than 0 , otherwise ALARM 3083 will occur.
- 5.The finishing stock allowance value K can not be larger than the value Q , otherwise ALARM 3089 will occur. (Value [R-Z] \geq Value Q \geq Value K \geq 0)
- 6.The pass depth Q can not be larger than value of total cutting depth (Value R- Value Z) , otherwise ALARM 3088 will occur.(Value [R-Z] \geq Value Q \geq Value K \geq 0)
- 7.The cutter offset value must be larger than 0 , otherwise ALARM 3082 will occur.
- 8.The cutter radius compensation (G40,G41,G42) is not used.
- 9.These commands (D,F,R,Z,U,V) can not be omitted , otherwise ALARM 3081 will occur.
- 10.The G65 code is effective only in the block in which it is specified.

%
 O9921(SQUARE UNI DIR)
 (G65P9921X-Y-U-V-D-R-Z-F-E-C-K-Q-)
 #31=#4001
 #33=#4003
 #32=#5003
 IF[#24EQ#0]GOTO10
 GOTO20
 N10#24=#5001
 N20IF[#25EQ#0]GOTO30
 GOTO40
 N30#25=#5002
 N40IF[#18EQ#0]GOTO993(R)
 IF[#18-#26]LT0]GOTO993
 IF[#26EQ#0]GOTO994(Z)
 IF[#7*#9*#21*#22]EQ0]GOTO990
 IF[#21LT0]GOTO990
 IF[#22LT0]GOTO990
 #10=#[2200+#7]+#[2000+#7](OFFSET-B-TYPE) OR #10=#[13000+#7]+#[12000+#7](OFFSET-C-TYPE)
 IF[#10LE0]GOTO991
 IF[#8EQ#0]GOTO50
 GOTO60
 N50#8=0.60
 N60IF[#8GT1]GOTO996
 IF[#3EQ#0]GOTO70
 GOTO80
 N70#3=#10
 N80IF[#3LT0]GOTO992
 IF[#6EQ#0]GOTO90
 GOTO100
 N90#6=0
 N100#26=#26+#6
 IF[#17EQ#0]GOTO110
 GOTO120
 N110#17=#18-#26
 N120IF[#17GT[#18-#26]]GOTO997(Q-GT-[R-Z])
 IF[#6GT#17]GOTO998(K-GT-Q)
 #27=#24-[#3+#10]
 #28=#25+#10*[2*#8-1]

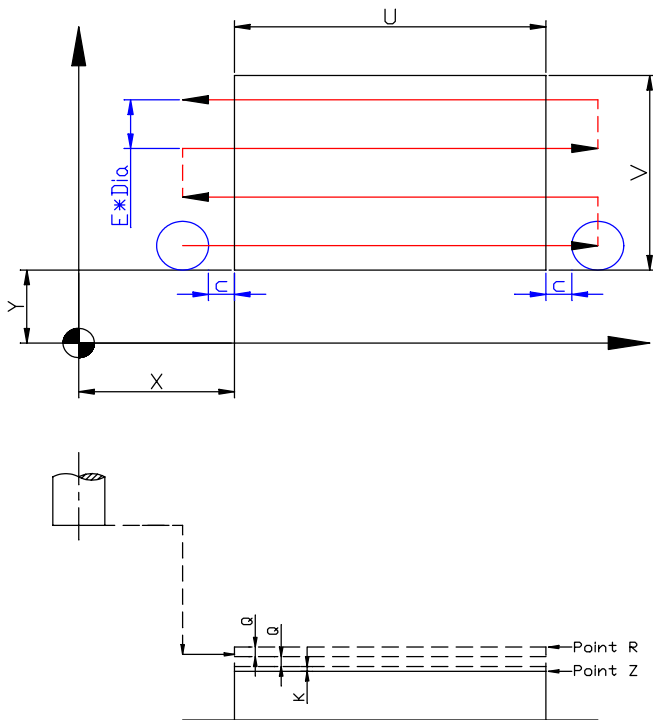
```

#29=#18-#17
#30=#28
#14=2*#10*#8
D01
#28=#30
G00X#27Y#28
Z#18
G01Z#29F[#9/2]
D02
G01X[#21+#3+#10+#24]F#9
#12=#28+#10-#25
IF[#12GE#22]GOTO200
#28=#28+#14
G00Z#18
G00Z#32
G00Y#28X#27
G00Z#18
G01Z#29F[#9/2]
END2
N200#29=#29-#17
IF[#29GE#26]GOTO300
IF[#29+#17]EQ#26]GOTO400
#29=#26
N300G00G90Z#18
Z#32
END1
N400(***END-OF-CYCLE***)
IF[#6EQ0]GOTO500
#26=#26-#6
G00G90Z#18
Z#32
#28=#30
G00G90X#27Y#28
Z#18
G01Z#26F[#9/2]
D03
G01X[#21+#3+#10+#24]F#9
#12=#28+#10-#25
IF[#12GE#22]GOTO500

```

#28=#28+#14
G00Z#18
G00Z#32
G00Y#28X#27
G00Z#18
G01Z#26F[#9/2]
END3
N500(***END-OF-FINISH***)
G00G90Z#18
Z#32
G#31G#33F#9
GOTO999
N990#3000=81(DATA-LACK-OR-ERROR-D.F.U.V.)
N991#3000=82(OFFSET-ERROR)
N992#3000=83(DATA-ERROR-FOR-C.)
N993#3000=84(RAPID-APPROACH-POINT-R.)
N994#3000=85(Z-END-POINT-Z.)
N995#3000=86(CORNER-RADIUS-I.)
N996#3000=87(MODIFY-E.)
N997#3000=88(MODIFY-Q.)
N998#3000=89(MODIFY-K.)
N999M99
%

(7) SQUARE BI DIR(四方形雙向面銑) O9922

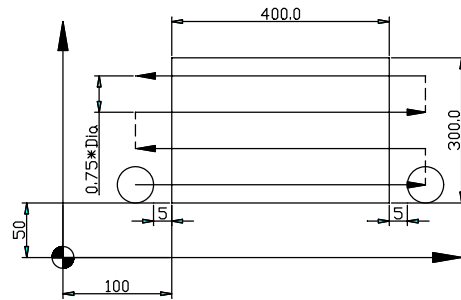


G65P9922X_Y_Z_R_U_V_D_F_E_C_K_Q_)

Argument	Meaning	If omitted
X	Absolute coordination of the left down point	According to previous point
Y	Absolute coordination of the left down point	According to previous point
Z	Finish depth	Alarm 3085
R	Starting depth and rapid approach point	Alarm 3084
U	Horizontal side length	Alarm 3081
V	Longitudinal side length	Alarm 3081
D	Cutter radius offset NO.	Alarm 3081
F	Feedrate	Alarm 3081
E	The percentage of the effectual cutting width ($E \leq 1$)	$E=0.60$
C	Clearance	$C=\text{Radius of cutter}$
K	Finish stock allowance	$K=0$
Q	Pass depth	$Q=R-Z+K$

Example : Square BI DIR milling

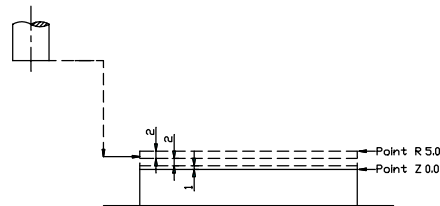
Ø75.0mm Face mill	D02=37.5
Spindle speed	600 rpm
Feedrate	720 mm/min
Cutting	5 mm
Pass rough machining depth	2.0 mm
Finish stock allowance	1.0 mm
Z axis start point	50.0 mm above workpiece
Start cutting point	R5.0
Finish cutting point	Z0.0



Program : %

```

O1225
G40G49G80
G00G90G54X0Y0
G43H01Z50.M3S600
G65P9922X100.0Y50.0Z0.0R5.0U400.0V300.0D02F720E0.75C5.0K1.0Q2.0
G80G91G28Z0
M30
%
```



Note :1.The command (G65P9922) include the finishing cutting.

- 2.The value U and V must be larger than 0 , otherwise ALARM 3081 will occur.
- 3.The percentage of effectual cutting width E can not be larger than 1.0 , otherwise ALARM 3087 will occur.
- 4.The clearance C can not be less than 0 , otherwise ALARM 3083 will occur.
- 5.The finishing stock allowance value K can not be larger than the value Q , otherwise ALARM 3089 will occur. (Value [R-Z] \geq Value Q \geq Value K \geq 0)
- 6.The pass depth Q can not be larger than value of total cutting depth (Value R- Value Z) , otherwise ALARM 3088 will occur.(Value [R-Z] \geq Value Q \geq Value K \geq 0)
- 7.The cutter offset value must be larger than 0 , otherwise ALARM 3082 will occur.
- 8.The cutter radius compensation (G40,G41,G42) is not used.
- 9.These commands (D,F,R,Z,U,V) can not be omitted , otherwise ALARM 3081 will occur.
- 10.The G65 code is effective only in the block in which it is specified.

%
 O9922(SQUARE BI DIR)
 (G65P9922X-Y-U-V-D-R-Z-F-E-C-K-Q-)
 #31=#4001
 #33=#4003
 #32=#5003
 IF[#24EQ#0]GOTO10
 GOTO20
 N10#24=#5001
 N20IF[#25EQ#0]GOTO30
 GOTO40
 N30#25=#5002
 N40IF[#18EQ#0]GOTO993(R)
 IF[#18-#26]LT0]GOTO993
 IF[#26EQ#0]GOTO994(Z)
 IF[#7*#9*#21*#22]EQ0]GOTO990
 IF[#21LT0]GOTO990
 IF[#22LT0]GOTO990
 #10=#[2200+#7]+#[2000+#7](OFFSET-B-TYPE) OR #10=#[13000+#7]+#[12000+#7](OFFSET-C-TYPE)
 IF[#10LE0]GOTO991
 IF[#8EQ#0]GOTO50
 GOTO60
 N50#8=0.60
 N60IF[#8GT1]GOTO996
 IF[#3EQ#0]GOTO70
 GOTO80
 N70#3=#10
 N80IF[#3LT0]GOTO992
 IF[#6EQ#0]GOTO90
 GOTO100
 N90#6=0
 N100#26=#26+#6
 IF[#17EQ#0]GOTO110
 GOTO120
 N110#17=#18-#26
 N120IF[#17GT[#18-#26]]GOTO997(Q-GT-[R-Z])
 IF[#6GT#17]GOTO998(K-GT-Q)
 #27=#24-[#3+#10]
 #28=#25+#10*[2*#8-1]

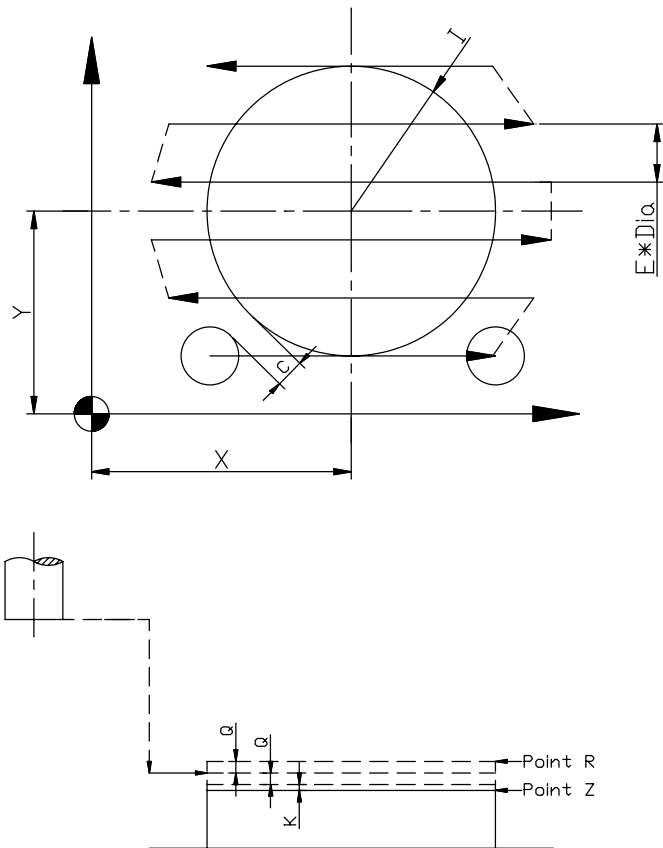
```

#29=#18-#17
#30=#28
#14=2*#10*#8
D01
#28=#30
G00X#27Y#28
Z#18
G01Z#29F[#9/2]
D02
G01X[#21+#3+#10+#24]F#9
#12=#28+#10-#25
IF[#12GE#22]GOTO200
#28=#28+#14
G00Y#28
G01X#27F#9
#12=#28+#10-#25
IF[#12GE#22]GOTO200
#28=#28+#14
G00Y#28
END2
N200#29=#29-#17
IF[#29GE#26]GOTO300
IF[#29+#17]EQ#26]GOTO400
#29=#26
N300G00G90Z#18
Z#32
END1
N400(**END-OF-CYCLE**)
IF[#6EQ0]GOTO500
#26=#26-#6
G00G90Z#18
Z#32
#28=#30
G00G90X#27Y#28
Z#18
G01Z#26F[#9/2]
D03
G01X[#21+#3+#10+#24]F#9
#12=#28+#10-#25

```

```
IF[#12GE#22]GOTO500
#28=#28+#14
G00Y#28
G01X#27F#9
#12=#28+#10-#25
IF[#12GE#22]GOTO500
#28=#28+#14
G00Y#28
END3
N500(***END-OF-FINISH***)
G00G90Z#18
Z#32
G#31G#33F#9
GOTO999
N990#3000=81(DATA-LACK-OR-ERROR-D.F.U.V.)
N991#3000=82(OFFSET-ERROR)
N992#3000=83(DATA-ERROR-FOR-C.)
N993#3000=84(RAPID-APPROACH-POINT-R.)
N994#3000=85(Z-END-POINT-Z.)
N995#3000=86(CORNER-RADIUS-I.)
N996#3000=87(MODIFY-E.)
N997#3000=88(MODIFY-Q.)
N998#3000=89(MODIFY-K.)
N999M99
%
```

(8) CIRCLE FACING(圓形雙向面銑) O9923

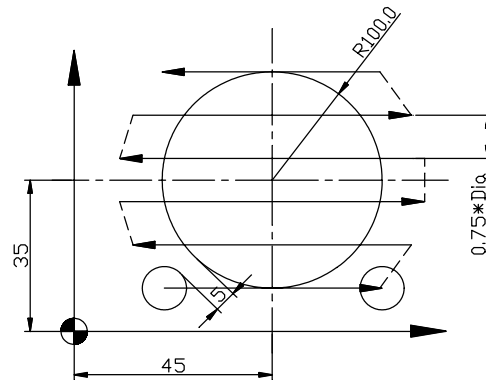


G65P9923X_Y_Z_R_I_D_F_E_C_K_Q_)

Argument	Meaning	If omitted
X	Absolute coordination of the circle center	According to previous point
Y	Absolute coordination of the circle center	According to previous point
Z	Finish depth	Alarm 3085
R	Starting depth and rapid approach point	Alarm 3084
I	Radius of circle	Alarm 3081
D	Cutter radius offset NO.	Alarm 3081
F	Feedrate	Alarm 3081
E	The percentage of the effectual cutting width ($E \leq 1$)	$E=0.60$
C	Clearance	$C=\text{Radius of cutter}$
K	Finish stock allowance	$K=0$
Q	Pass depth	$Q=R-Z+K$

Example : Circle facing milling

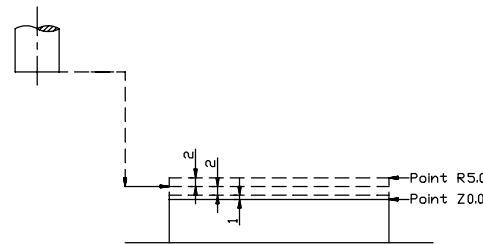
Ø75.0mm Face mill	D02=37.5
Spindle speed	600 rpm
Feedrate	720 mm/min
Cutting	5 mm
Pass rough machining depth	2.0 mm
Finish stock allowance	1.0 mm
Z axis star point	50.0 mm above workpiece
Star cutting point	R5.0
Finish cutting point	Z0.0



Program : %

```

O1225
G40G49G80
G00G90G54X0Y0
G43H01Z50.M3S600
G65P9923X45.0Y35.0Z0.0R5.0I100.0D02F720E0.75C5.0K1.0Q2.0
G80G91G28Z0
M30
%
```



Note :1.The command (G65P9923) include the finishing cutting.

- 2.The percentage of effectual cutting width E can not be larger than 1.0 , otherwise ALARM 3087 will occur.
- 3.The clearance C can not be less than 0 , otherwise ALARM 3083 will occur.
- 4.The finishing stock allowance value K can not be larger than the value Q , otherwise ALARM 3089 will occur. (Value [R-Z] \geq Value Q \geq Value K \geq 0)
- 5.The pass depth Q can not be larger than value of total cutting depth (Value R- Value Z) , otherwise ALARM 3088 will occur.(Value [R-Z] \geq Value Q \geq Value K \geq 0)
- 6.The cutter offset value must be larger than 0 , otherwise ALARM 3082 will occur.

7. The cutter radius compensation (G40,G41,G42) is not used.
8. These commands (D,F,R,Z,I) can not be omitted , otherwise ALARM 3081 will occur.
9. The G65 code is effective only in the block in which it is specified.

%

```

O9923(CIRCLE-FACING)
(G65P9923X-Y-I-D-R-Z-F-E-C-K-Q-)
#31=#4001
#33=#4003
#32=#5003
IF[#24EQ#0]GOTO10
GOTO20
N10#24=#5001
N20IF[#25EQ#0]GOTO30
GOTO40
N30#25=#5002
N40IF[#18EQ#0]GOTO993(R)
IF[#18-#26]LT0]GOTO993
IF[#26EQ#0]GOTO994(Z)
IF[#7*#9*#4]EQ0]GOTO990
IF[#4LT0]GOTO990
#10=#[2200+#7]+#[2000+#7](OFFSET-B-TYPE) OR #10=#[13000+#7]+#[12000+#7](OFFSET-C-TYPE)
IF[#10LE0]GOTO991
IF[#8EQ#0]GOTO50
GOTO60
N50#8=0.60(EFFECTUAL-CUTTING-WIDTH-PERCENTER)
N60IF[#8GT1]GOTO996
IF[#3EQ#0]GOTO70
GOTO80
N70#3=#10
N80IF[#3LT0]GOTO992
IF[#6EQ#0]GOTO90
GOTO100
N90#6=0
N100#26=#26+#6
IF[#17EQ#0]GOTO110
GOTO120
N110#17=#18-#26
N120IF[#17GT[#18-#26]]GOTO997(Q-GT-[R-Z])

```



```

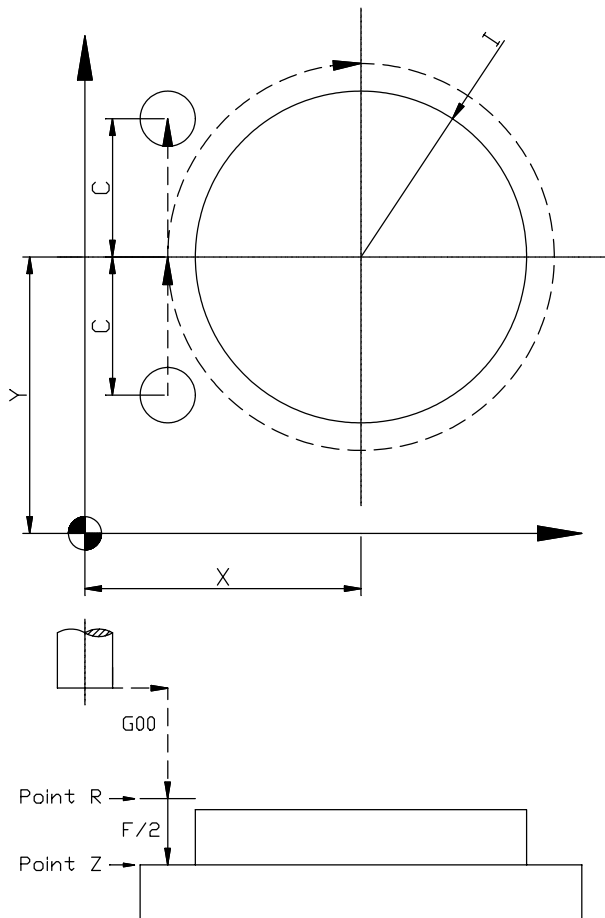
IF[#6GT#17]GOTO998(K-GT-Q)
#12=#4+#3+#10(TRACE-RADIUS)
#14=2*#10*#8(Y-INCREMENT)
#28=[#25-#4]+#10*[2*#8-1]
#29=#18-#17
#30=#28
D01
#28=#30
#16=#24-SQRT[#12*#12-[#28-#25]*[#28-#25]]
G00G90X#16Y#28
Z#18
G01Z#29F[#9/2]
D02
#15=#24+SQRT[#12*#12-[#28-#25]*[#28-#25]]
G01X#15F#9
#27=#28+#10
IF[#27GE[#25+#4]]GOTO200
#28=#28+#14
#15=#24+SQRT[#12*#12-[#28-#25]*[#28-#25]]
G00Y#28X#15
#16=#24-SQRT[#12*#12-[#28-#25]*[#28-#25]]
G01X#16F#9
#27=#28+#10
IF[#27GE[#25+#4]]GOTO200
#28=#28+#14
#16=#24-SQRT[#12*#12-[#28-#25]*[#28-#25]]
G00Y#28X#16
END2
N200#29=#29-#17
IF[#29GE#26]GOTO300
IF[#29+#17]EQ#26]GOTO400
#29=#26
N300G00G90Z#18
Z#32
END1
N400(***END-OF-CYCLE***)
IF[#6EQ0]GOTO500
#26=#26-#6
G00G90Z#18

```

```

Z#32
#28=#30
#16=#24-SQRT[#12*#12-[#28-#25]*[#28-#25]]
G00G90X#16Y#28
Z#18
G01Z#26F[#9/2]
D03
#15=#24+SQRT[#12*#12-[#28-#25]*[#28-#25]]
G01X#15F#9
#27=#28+#10
IF[#27GE[#25+#4]]GOTO500
#28=#28+#14
#15=#24+SQRT[#12*#12-[#28-#25]*[#28-#25]]
G00Y#28X#15
#16=#24-SQRT[#12*#12-[#28-#25]*[#28-#25]]
G01X#16F#9
#27=#28+#10
IF[#27GE[#25+#4]]GOTO500
#28=#28+#14
#16=#24-SQRT[#12*#12-[#28-#25]*[#28-#25]]
G00Y#28X#16
END3
N500(***END-OF-FINISH***)
G00G90Z#18
Z#32
G#31G#33F#9
GOTO999
N990#3000=81(DATA-LACK-OR-ERROR-I.D.F)
N991#3000=82(OFFSET-ERROR)
N992#3000=83(DATA-ERROR-FOR-C.)
N993#3000=84(RAPID-APPROACH-POINT-R.)
N994#3000=85(Z-END-POINT-Z.)
N995#3000=86(CORNER-RADIUS-I.)
N996#3000=87(MODIFY-E.)
N997#3000=88(MODIFY-Q.)
N998#3000=89(MODIFY-K.)
N999M99
%
```

(9) CIRCLE OUTSIDE(圓形外輪廓) O9931

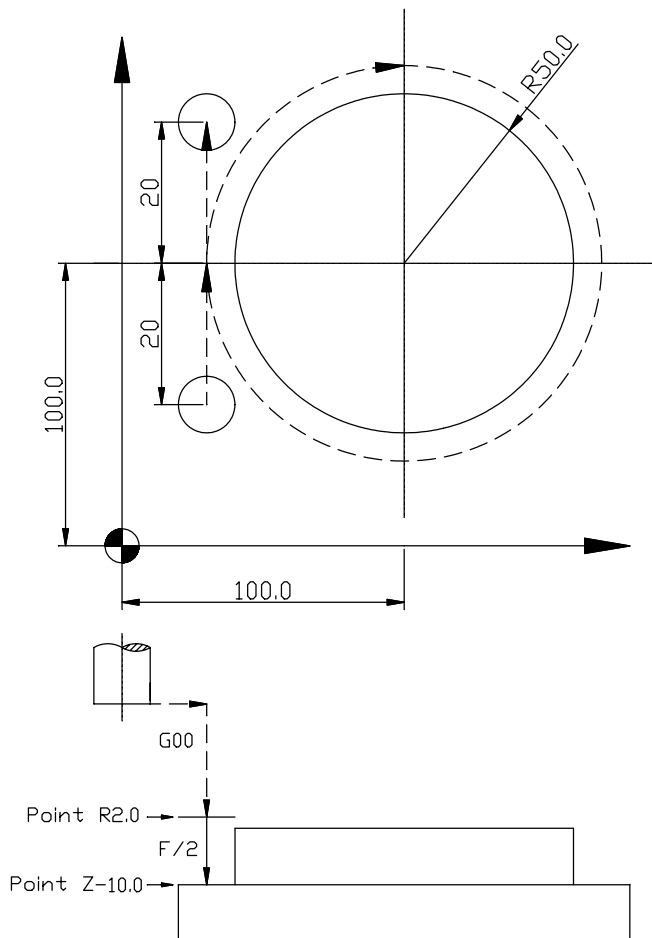


G65P9931X_Y_Z_R_I_D_F_C_M_)

Argument	Meaning	If omitted
X	Absolute coordination of the circle center	According to previous point
Y	Absolute coordination of the circle center	According to previous point
Z	Finish depth	Alarm 3085
R	Rapid approach point R	Alarm 3084
I	Cutting circle radius	Alarm 3081
D	Cutter radius offset NO.	Alarm 3081
F	Feedrate	Alarm 3081
C	Approach direction	Diameter of cutter
M	Cutting direction (M02 down cut) (M03 up cut)	M02 (down cut)

Example : Finish cutting outside of circle

Ø20.0mm End mill	D02=10.0
Spindle speed	1500 rpm
Feedrate	300 mm/min
Cutting circle radius	50.0 mm
Z axis start point	50.0 mm above workpiece
Rapid approach point R	R 2.0
Z end point	Z -10
Cutting direction	M02 (down cut)



Program : %

```

O1225
G40G49G80
G00G90G54X0Y0
G43H01Z50.M3S1500
G65P9931X100.0Y100.0Z-10.0R2.0I50.0D02F300C20.0M02
G80G91G28Z0
M30
%
```

- Note :1.The clearance C can not be less than cutter radius offset value , otherwise ALARM 3083 will occur.
- 2.The cutter radius offset value must be larger than 0 , otherwise ALARM 3082 will occur.
- 3.The cutter radius compensation (G40,G41,G42) is not used.
- 4.These commands (I,D,F,R,Z) can not be omitted , otherwise ALARM 3081, ALARM 3084, ALARM 3085 will occur.
- 5.The G65 code is effective only in the block in which it is specified.

%

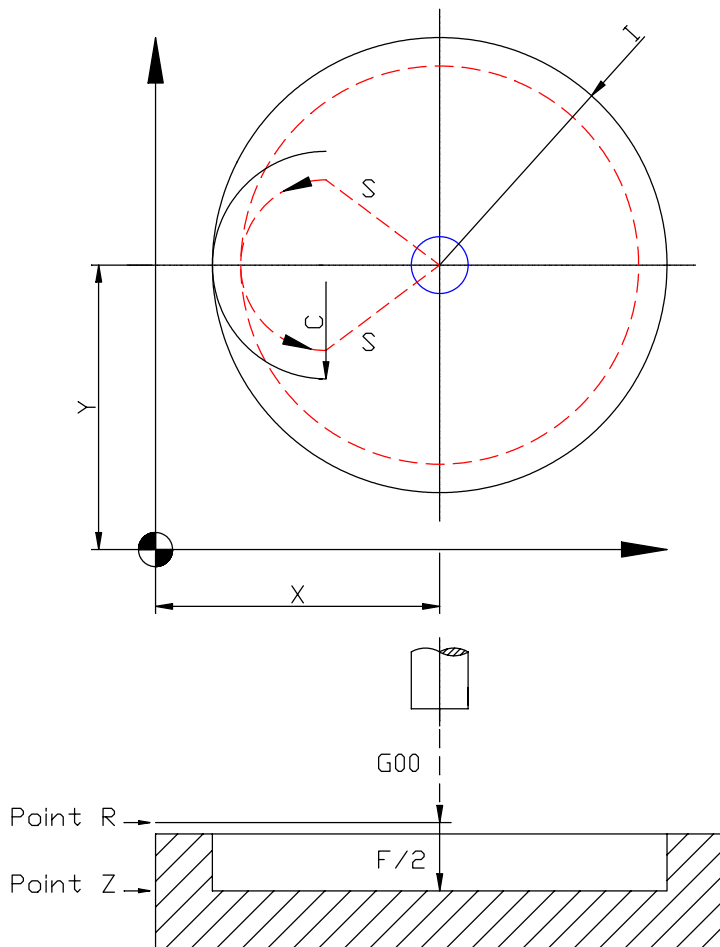
```

O9931(CIRCLE OUTSIDE)
(G65P9931I-D-F-R-Z-C-M-X-Y-)
#31=#4001
#33=#4003
#32=#5003
IF[#24EQ#0]GOTO10
GOTO20
N10#24=#5001
N20IF[#25EQ#0]GOTO30
GOTO40
N30#25=#5002
N40IF[#18EQ#0]GOTO993(R)
IF[#26EQ#0]GOTO994(Z)
IF[#4*#7*#9]EQ0]GOTO990
#10=#[2200+#7]+#[2000+#7](OFFSET-B-TYPE) OR #10=#[13000+#7]+#[12000+#7](OFFSET-C-TYPE)
IF[#10LE0]GOTO991
IF[#3EQ#0]GOTO50
GOTO60
N50#3=#10*2
N60IF[#3LT#10]GOTO992
IF[#13EQ2]GOTO70
IF[#13EQ#0]GOTO70
(***UP-CUTTING***)
G00G90X[#24-[#4+#10]]Y[#25+#3]
Z#18
G01Z#26F[#9/2]
X[#24-[#4+#10]]Y#25F#9
G03I[#4+#10]
G01X[#24-[#4+#10]]Y[#25-#3]
GOTO80

```

```
(***DOWN-CUTTING***)
N70G00G90X[#24-[#4+#10]]Y[#25-#3]
Z#18
G01Z#26F[#9/2]
X[#24-[#4+#10]]Y#25F#9
G02I[#4+#10]
G01X[#24-[#4+#10]]Y[#25+#3]
(***END-OF-CYCLE***)
N80G00G90Z#18
Z#32
G#31G#33F#9
GOTO999
N990#3000=81(DATA-LACK-FOR-I.D.F.)
N991#3000=82(OFFSET-ERROR)
N992#3000=83(DATA-ERROR-FOR-C.)
N993#3000=84(RAPID-APPROACH-POINT-R.)
N994#3000=85(Z-END-POINT-Z.)
N999M99
%
```

(10) CIRCLE INSIDE(圓形內輪廓) O9932

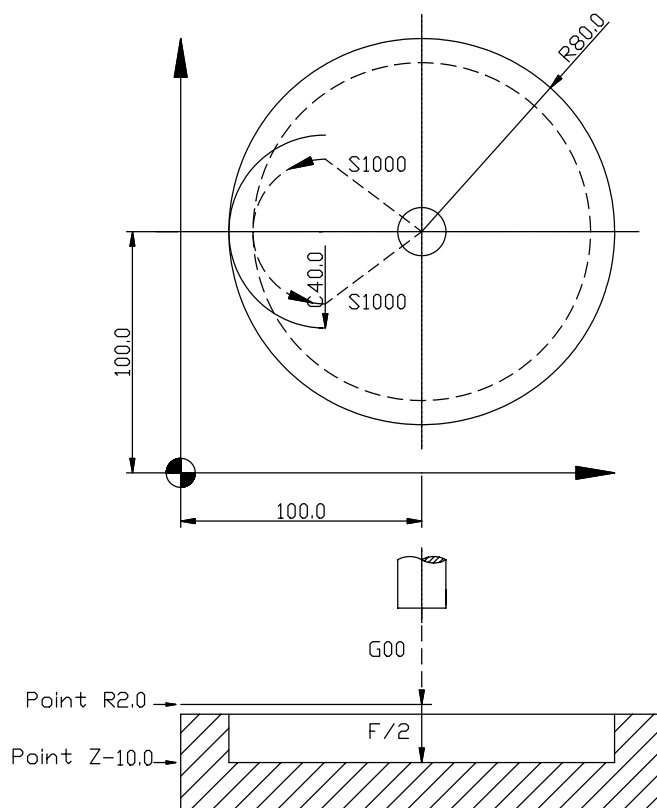


G65P9932X_Y_Z_R_I_D_F_C_S_M_)

Argument	Meaning	If omitted
X	Absolute coordination of the circle center	According to previous point
Y	Absolute coordination of the circle center	According to previous point
Z	Finish depth	Alarm 3085
R	Rapid approach point R	Alarm 3084
I	Cutting circle radius	Alarm 3081
D	Cutter radius offset NO.	Alarm 3081
F	Feedrate	Alarm 3081
C	Approach circle radius	1/2 of I
S	Approach feedrate or return	3 time of F
M	Cutting direction (M02 up cut) (M03 down cut)	M03 (down cut)

Example : Finish cutting inside of circle

Ø20.0mm End mill	D02=10.0
Spindle speed	1500 rpm
Feedrate	300 mm/min
Cutting circle radius	80.0 mm
Z axis start point	50.0 mm above workpiece
Rapid approach point R	R 2.0
Z end point	Z -10
Cutting direction	M03 (down cut)



Program : %

```

O1225
G40G49G80
G00G90G54X0Y0
G43H01Z50.M3S1500
G65P9932X100.0Y100.0Z-10.0R2.0I80.0D02F300C40.0S1000M03
G80G91G28Z0
M30
%
```


- Note :1.The cutting circle radius value (I) must be larger than or equal to approach circle radius value (C) , the approach circle radius value (C) must be larger than or equal to the cutter radius offset value and the cutter radius offset value must be larger than 0 , otherwise ALARM 3082 & ALARM 3083 will occur.
- 2.The cutter radius compensation (G40,G41,G42) is not used.
- 3.These commands (I,D,F,R,Z) can not be omitted , otherwise ALARM 3081, ALARM 3084, ALARM 3085 will occur.
- 4.The G65 code is effective only in the block in which it is specified.

%

```

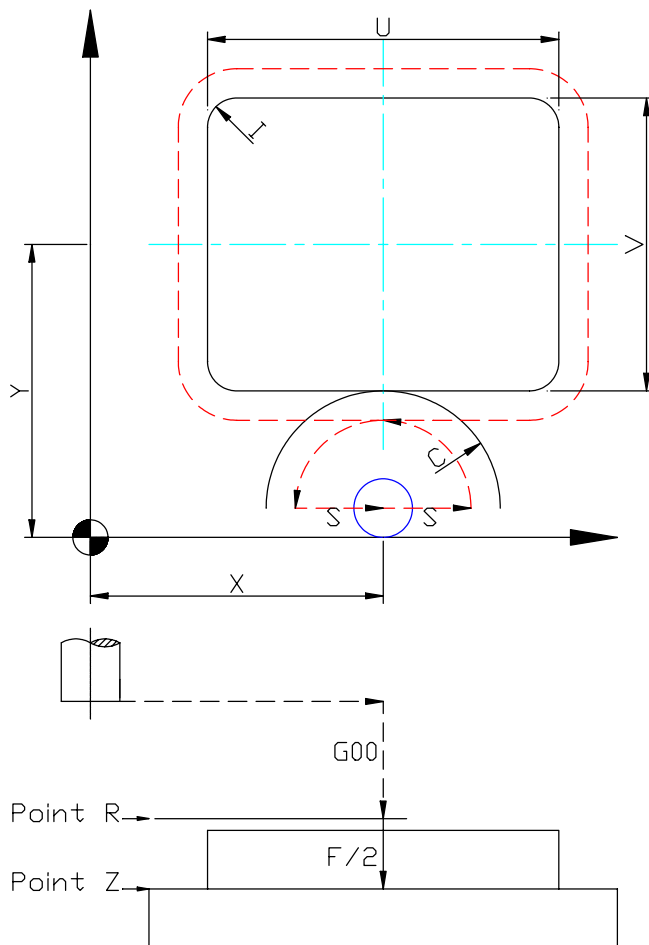
O9932(CIRCLE INSIDE)
(G65P9932I-D-F-R-Z-C-S-M-X-Y-)
#31=#4001
#33=#4003
#32=#5003
IF[#24EQ#0]GOTO10
GOTO20
N10#24=#5001
N20IF[#25EQ#0]GOTO30
GOTO40
N30#25=#5002
N40IF[#18EQ#0]GOTO993
IF[#26EQ#0]GOTO994
IF[#4*#7*#9]EQ0]GOTO990
#10=#[2200+#7]+#[2000+#7](OFFSET-B-TYPE) OR #10=#[13000+#7]+#[12000+#7](OFFSET-C-TYPE)
IF[#10LE0]GOTO991
IF[#10GT#4]GOTO991
IF[#3EQ#0]GOTO50
GOTO60
N50#3=#4/2
N60IF[#3GT#4]GOTO992
IF[#10GT#3]GOTO992
IF[#19EQ#0]GOTO70
GOTO80
N70#19=3*#9
N80G00G90X#24Y#25
Z#18
G01Z#26F[#9/2]
IF[#13EQ3]GOTO90
IF[#13EQ#0]GOTO90

```

```

(**UP-CUTTING**)
G01X[#24-[#4-#3]]Y[#25-[#3-#10]]F#19
G02X[#24-[#4-#10]]Y#25R[#3-#10]F#9
G02I[#4-#10]J0
G02X[#24-[#4-#3]]Y[#25+[#3-#10]]R[#3-#10]
G01X#24Y#25F#19
GOTO100
(**DOWN-CUTTING**)
N90G01X[#24-[#4-#3]]Y[#25+[#3-#10]]F#19
G03X[#24-[#4-#10]]Y#25R[#3-#10]F#9
G03I[#4-#10]J0
G03X[#24-[#4-#3]]Y[#25-[#3-#10]]R[#3-#10]
G01X#24Y#25F#19
(**END-OF-CYCLE**)
N100G00G90Z#18
Z#32
G#31G#33F#9
GOTO999
N990#3000=81(DATA-LACK-FOR-I.D.F.)
N991#3000=82(OFFSET-ERROR)
N992#3000=83(DATA-ERROR-FOR-C.)
N993#3000=84(RAPID-APPROACH-POINT-R.)
N994#3000=85(Z-END-POINT-Z.)
N999M99
%
```

(11) SQUARE OUTSIDE(方形外輪廓) O9933

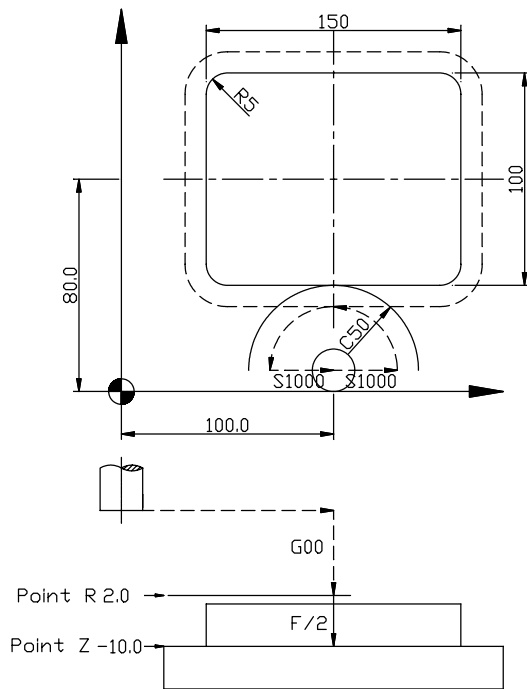


G65P9933X_Y_Z_R_I_D_F_U_V_C_S_M_)

Argument	Meaning	If omitted
X	Absolute coordination of the square center	According to previous point
Y	Absolute coordination of the square center	According to previous point
Z	Z end point	Alarm 3085
R	Rapid approach point R	Alarm 3084
I	Radius of corner arc	No corner arc(I=0)
D	Cutter radius offset NO.	Alarm 3081
F	Feedrate	Alarm 3081
U	Horizontal side length	Alarm 3081
V	Longitudinal side length	Alarm 3081
C	Approach circle radius	Alarm 3081
S	Approach feedrate	3 time of F
M	Cutting direction (M02 down cut) (M03 up cut)	M02 (down cut)

Example : Finish cutting outside of square

Ø20.0mm End mill	D02=10.0
Spindle speed	1500 rpm
Feedrate	300 mm/min
Z axis start point	50.0 mm above workpiece
Rapid approach point R	R 2.0
Z end point	Z -10
Cutting direction	M02 (down cut)



Program : %

```

O1225
G40G49G80
G00G90G54X0Y0
G43H01Z50.M3S1500
G65P9933X100.Y80.Z-10.0R2.0I5.0D02F300U150.V100.C50.0S1000M02
G80G91G28Z0
M30
%
```

- Note :1.The approach circle radius value C can not be less than cutter radius offset value ,
 Otherwise ALARM 3083 will occur.
- 2.The cutter radius offset value must be larger than 0 , otherwise ALARM 3082
 will occur.
- 3.The cutter radius compensation (G40,G41,G42) is not used.
- 4.These commands (C,D,F,R,Z,U,V) can not be omitted , otherwise ALARM 3081,
 ALARM 3084, ALARM 3085 will occur.
- 5.The G65 code is effective only in the block in which it is specified.

%

```

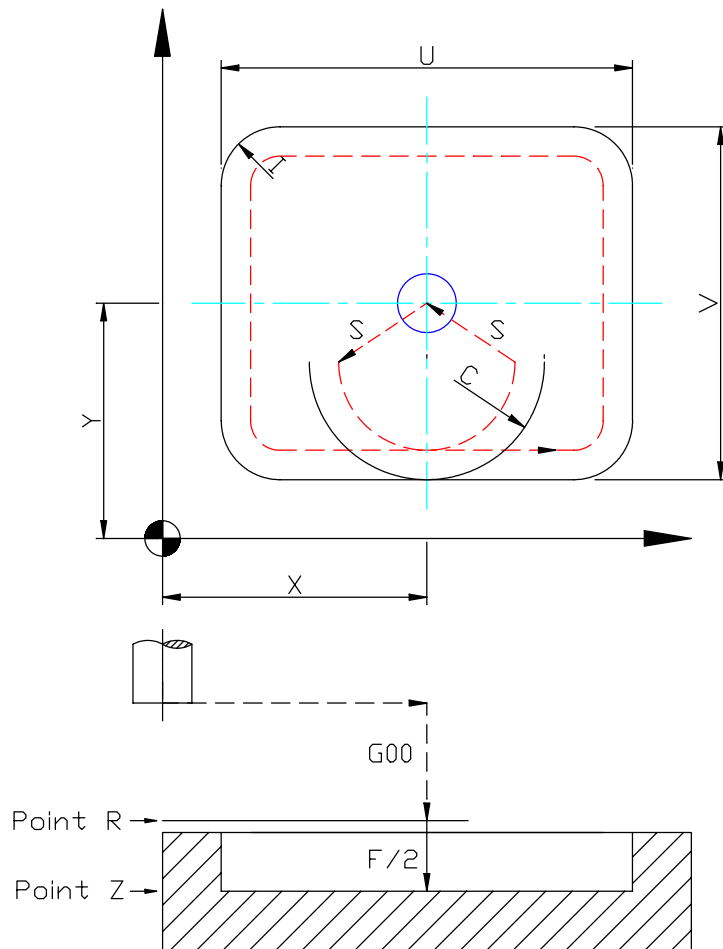
O9933(SQUARE OUTSIDE)
(G65P9933C-D-F-U-V-R-Z-I-S-M-X-Y-)
#31=#4001
#33=#4003
#32=#5003
IF[#24EQ#0]GOTO10
GOTO20
N10#24=#5001
N20IF[#25EQ#0]GOTO30
GOTO40
N30#25=#5002
N40IF[#18EQ#0]GOTO993(R)
IF[#26EQ#0]GOTO994(Z)
IF[[#3*#7*#9*#21*#22]EQ0]GOTO990(C.D.F.U.V.)
#10=#[2200+#7]+#[2000+#7](OFFSET-B-TYPE) OR #10=#[13000+#7]+#[12000+#7](OFFSET-C-TYPE)
IF[#10LE0]GOTO991
IF[#4EQ#0]GOTO50
GOTO60
N50#4=0
N60IF[#10GT#3]GOTO992(D-GT-C)
IF[#19EQ#0]GOTO70
GOTO80
N70#19=3*#9
N80G00G90X#24Y[#25-[[#22/2]+#3]]
Z#18
G01Z#26F[#9/2]
IF[#13EQ2]GOTO90
IF[#13EQ#0]GOTO90
(***UP-CUTTING***)
G01X[#24-[#3-#10]]Y[#25-[[#22/2]+#3]]F#19

```

```

G02X#24Y[#25-[[#22/2]+#10]]R[#3-#10]F#9
G01X[#24+[#21/2]+#10]]Y[#25-[[#22/2]+#10]],R[#4+#10]
X[#24+[#21/2]+#10]]Y[#25+[#22/2]+#10]],R[#4+#10]
X[#24-[[#21/2]+#10]]Y[#25+[#22/2]+#10]],R[#4+#10]
X[#24-[[#21/2]+#10]]Y[#25-[[#22/2]+#10]],R[#4+#10]
X#24Y[#25-[[#22/2]+#10]]
G02X[#24+[#3-#10]]Y[#25-[[#22/2]+#3]]R[#3-#10]
G01X#24Y[#25-[[#22/2]+#3]]F#19
GOTO100
(***DOWN-CUTTING***)
N90G01X[#24+[#3-#10]]Y[#25-[[#22/2]+#3]]F#19
G03X#24Y[#25-[[#22/2]+#10]]R[#3-#10]F#9
G01X[#24-[[#21/2]+#10]]Y[#25-[[#22/2]+#10]],R[#4+#10]
X[#24-[[#21/2]+#10]]Y[#25+[#22/2]+#10]],R[#4+#10]
X[#24+[#21/2]+#10]]Y[#25+[#22/2]+#10]],R[#4+#10]
X[#24+[#21/2]+#10]]Y[#25-[[#22/2]+#10]],R[#4+#10]
X#24Y[#25-[[#22/2]+#10]]
G03X[#24-[#3-#10]]Y[#25-[[#22/2]+#3]]R[#3-#10]
G01X#24Y[#25-[[#22/2]+#3]]F#19
(***END-OF-CYCLE***)
N100G00G90Z#18
Z#32
G#31G#33F#9
GOTO999
N990#3000=81(DATA-LACK-FOR-C.D.F.U.V.)
N991#3000=82(OFFSET-ERROR)
N992#3000=83(DATA-ERROR-FOR-C.)
N993#3000=84(RAPID-APPROACH-POINT-R.)
N994#3000=85(Z-END-POINT-Z.)
N995#3000=86(CORNER-RADIUS-I.)
N999M99
%
```

(12) SQUARE INSIDE(方形内轮廓) 09934

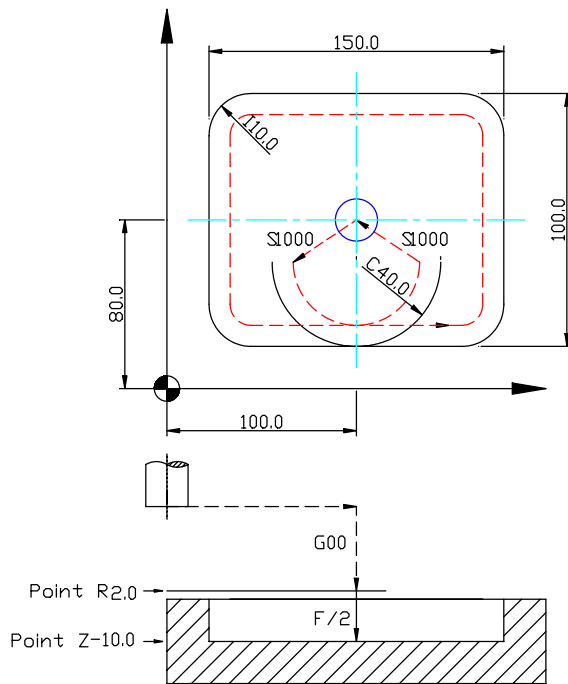


G65P9934X_Y_Z_R_I_D_F_U_V_C_S_M_)

Argument	Meaning	If omitted
X	Absolute coordination of the square center	According to previous point
Y	Absolute coordination of the square center	According to previous point
Z	Z end point	Alarm 3085
R	Rapid approach point R	Alarm 3084
I	Radius of corner arc	I= Radius of cutter
D	Cutter radius offset NO.	Alarm 3081
F	Feedrate	Alarm 3081
U	Horizontal side length	Alarm 3081
V	Longitudinal side length	Alarm 3081
C	Approach circle radius	Alarm 3081
S	Approach feedrate	3 time of F
M	Cutting direction (M02 up cut) (M03 down cut)	M03 (down cut)

Example : Finish cutting inside of square

Ø16.0mm End mill	D02=8.0
Spindle speed	1875 rpm
Feedrate	375 mm/min
Z axis star point	50.0 mm above workpiece
Rapid approach point R	R 2.0
Z end point	Z -10.0
Cutting direction	M03 (down cut)



Program : %

```

O1225
G40G49G80
G00G90G54X0Y0
G43H01Z50.M3S1875
G65P9934X100.Y80.Z-10.0R2.0I10.0D02F375U150.V100.C40.0S1000M03
G80G91G28Z0
M30
%
```


- Note :1.The approach circle radius value C can not be less than cutter radius offset value ,
 Otherwise ALARM 3083 will occur.
- 2.The cutter radius offset value must be larger than 0 , otherwise ALARM 3082
 will occur.
- 3.The cutter radius compensation (G40,G41,G42) is not used.
- 4.These commands (C,D,F,R,Z,U,V) can not be omitted , otherwise ALARM 3081,
 ALARM 3084, ALARM 3085 will occur.
- 5.The G65 code is effective only in the block in which it is specified.

%

```

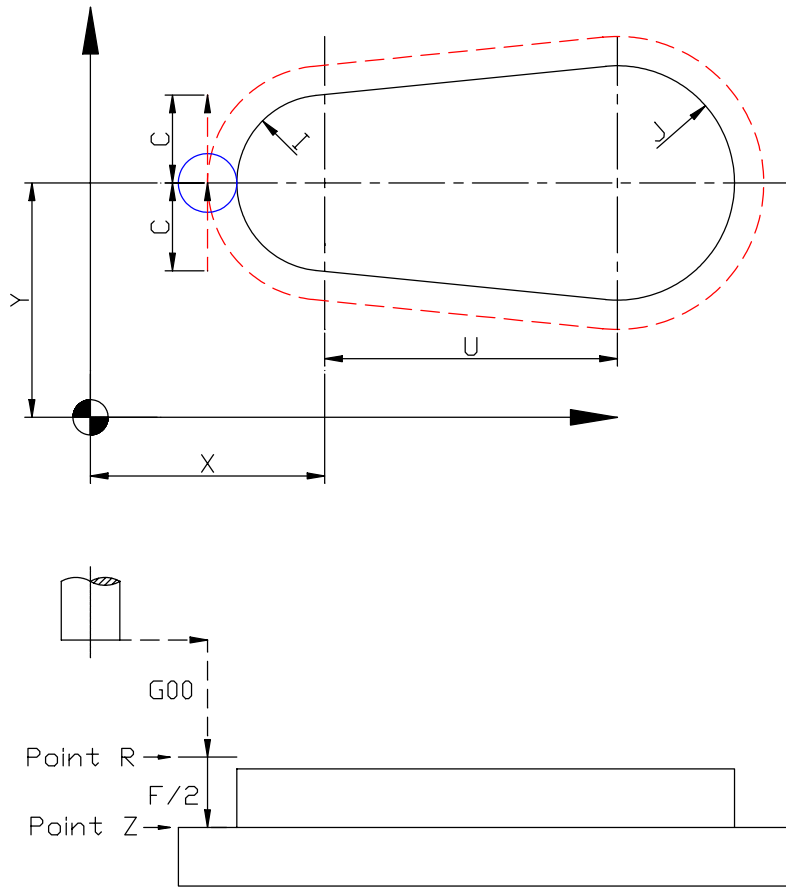
O9934(SQUARE-INSIDE)
(G65P9934C-D-F-U-V-R-Z-I-S-M-X-Y-)
#31=#4001
#33=#4003
#32=#5003
IF[#24EQ#0]GOTO10
GOTO20
N10#24=#5001
N20IF[#25EQ#0]GOTO30
GOTO40
N30#25=#5002
N40IF[#18EQ#0]GOTO993
IF[#26EQ#0]GOTO994
IF[#3*#7*#9*#21*#22]EQ0]GOTO990
#10=#[2200+#7]+#[2000+#7](OFFSET-B-TYPE) OR #10=#[13000+#7]+#[12000+#7](OFFSET-C-TYPE)
IF[#10LE0]GOTO991
IF[#4EQ#0]GOTO50
GOTO60
N50#4=#10
N60IF[#10GT#4]GOTO995(D-GT-I)
IF[#10GT[#21/2]]GOTO991(D-GT-U/2)
IF[#10GT[#22/2]]GOTO991(D-GT-V/2)
IF[#10GT#3]GOTO992(D-GT-C)
IF[#3GT[#21/2]]GOTO992(C-GT-U/2)
IF[#3GT[#22/2]]GOTO992(C-GT-V/2)
IF[#19EQ#0]GOTO70
GOTO80
N70#19=3*#9
N80G00G90X#24Y#25
Z#18

```

```

G01Z#26F[#9/2]
IF[#13EQ3]GOTO90
IF[#13EQ#0]GOTO90
(***UP-CUTTING***)
G01X[#24+[#3-#10]]Y[#25-[[#22/2]-#3]]F#19
G02X#24Y[#25-[[#22/2]-#10]]R[#3-#10]F#9
G01X[#24-[[#21/2]-#10]]Y[#25-[[#22/2]-#10]],R[#4-#10]
X[#24-[[#21/2]-#10]]Y[#25+[[#22/2]-#10]],R[#4-#10]
X[#24+[[#21/2]-#10]]Y[#25+[[#22/2]-#10]],R[#4-#10]
X[#24+[[#21/2]-#10]]Y[#25-[[#22/2]-#10]],R[#4-#10]
X#24Y[#25-[[#22/2]-#10]]
G02X[#24-[#3-#10]]Y[#25-[[#22/2]-#3]]R[#3-#10]
G01X#24Y#25F#19
GOTO100
(***DOWN-CUTTING***)
N90G01X[#24-[#3-#10]]Y[#25-[[#22/2]-#3]]F#19
G03X#24Y[#25-[[#22/2]-#10]]R[#3-#10]F#9
G01X[#24+[[#21/2]-#10]]Y[#25-[[#22/2]-#10]],R[#4-#10]
X[#24+[[#21/2]-#10]]Y[#25+[[#22/2]-#10]],R[#4-#10]
X[#24-[[#21/2]-#10]]Y[#25+[[#22/2]-#10]],R[#4-#10]
X[#24-[[#21/2]-#10]]Y[#25-[[#22/2]-#10]],R[#4-#10]
X#24Y[#25-[[#22/2]-#10]]
G03X[#24+[#3-#10]]Y[#25-[[#22/2]-#3]]R[#3-#10]
G01X#24Y#25F#19
(***END-OF-CYCLE***)
N100G00G90Z#18
Z#32
G#31G#33F#9
GOTO999
N990#3000=81(DATA-LACK-FOR-C.D.F.U.V.)
N991#3000=82(OFFSET-ERROR)
N992#3000=83(DATA-ERROR-FOR-C.)
N993#3000=84(RAPID-APPROACH-POINT-R.)
N994#3000=85(Z-END-POINT-Z.)
N995#3000=86(CORNER-RADIUS-I.)
N999M99
%
```

(13) TRACK OUTSIDE(跑道形外輪廓) O9935



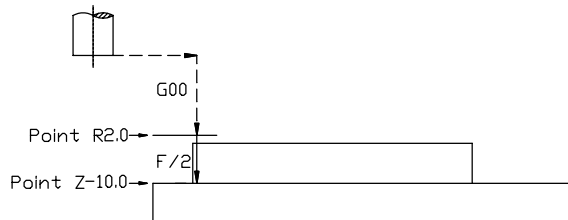
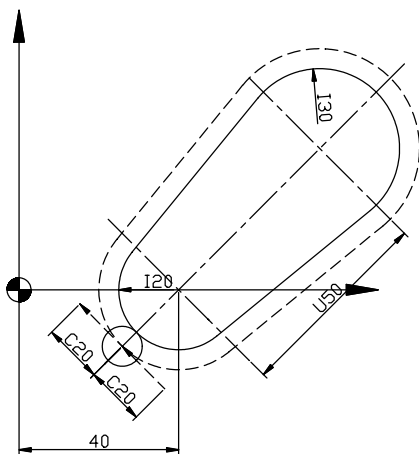
G65P9935X_Y_Z_R_I_J_U_D_F_C_M_)

Argument	Meaning	If omitted
X	Absolute coordination of left arc center	According to previous point
Y	Absolute coordination of left arc center	According to previous point
Z	Track bottom point Z	Alarm 3085
R	Rapid approach point R	Alarm 3084
I	Radius of left cutting arc	Alarm 3081
J	Radius of dexter cutting arc	Alarm 3081
U	Distance between the two center of arc	Alarm 3081
D	Cutter radius offset NO.	Alarm 3081
F	Feedrate	Alarm 3081
C	Approach or return distance	Diameter of cutter
M	Cutting direction (M02 down cut) (M03 up cut)	M02 (down cut)

Example : Finish cutting outside of track , used G68 command to coordinate system rotation.

Ø20.0mm End mill	D02=10.0
Spindle speed	1500 rpm
Feedrate	300 mm/min
Z axis start point	50.0 mm above workpiece
Rapid approach point R	R 2.0
Z end point	Z -10.0
Cutting direction	M02 (down cut)

The absolute coordination for the rotatory center is (40,0) , and the coordinate system rotate for 45 degrees in the direction of counterclockwise.



Program : %

```

O1225
G40G49G80
G00G90G54X0Y0
G43H01Z50.M3S1500
G68X40.0Y0.R45.
G65P9935X40.Y0.Z-10.0R2.0I20.0J30.0D02F300U50. C20.0M02
G69
G80G91G28Z0
M30
%
```

- Note :1.The clearance C can not be less than cutter radius offset value , otherwise ALARM 3083 will occur.
- 2.The cutter radius offset value must be larger than 0 , otherwise ALARM 3082 will occur.
- 3.The cutter radius compensation (G40,G41,G42) is not used.
- 4.These commands (I,J,U,D,F,R,Z) can not be omitted , otherwise ALARM 3081, ALARM 3084, ALARM 3085 will occur.
- 5.The G65 code is effective only in the block in which it is specified.

%

```

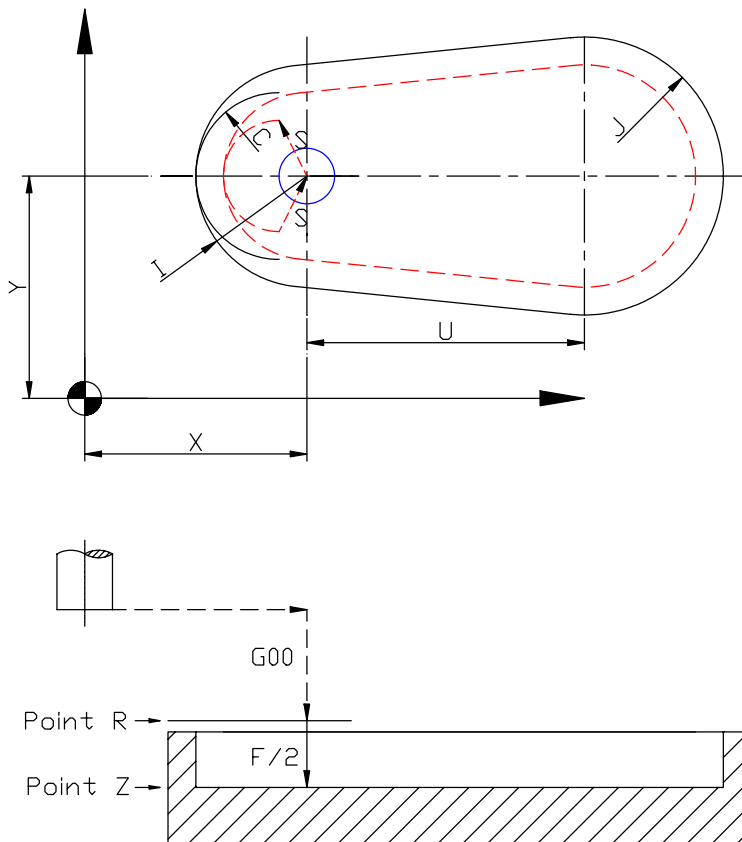
O9935(TRACK-OUTSIDE)
(G65P9935I-J-U-D-F-R-Z-C-M-X-Y-)
#31=#4001
#33=#4003
#32=#5003
IF[#24EQ#0]GOTO10
GOTO20
N10#24=#5001
N20IF[#25EQ#0]GOTO30
GOTO40
N30#25=#5002
N40IF[#18EQ#0]GOTO993(R)
IF[#26EQ#0]GOTO994(Z)
IF[#4*#5*#7*#9*#21]EQ0]GOTO990
#10=#[2200+#7]+#[2000+#7](OFFSET-B-TYPE) OR #10=#[13000+#7]+#[12000+#7](OFFSET-C-TYPE)
IF[#10LE0]GOTO991
IF[#3EQ#0]GOTO50
GOTO60
N50#3=#10*2(C=D)
N60#12=SQRT[#21*#21-[#5-#4]*[#5-#4]]
#14=ATAN[#5-#4]/[#12](ANGLE)
#27=[#4+#10]*SIN[#14](XA)
#28=[#4+#10]*COS[#14](YA)
#29=[#5+#10]*SIN[#14](XB)
#30=[#5+#10]*COS[#14](YB)
IF[#13EQ2]GOTO70
IF[#13EQ#0]GOTO70
(***UP-CUTTING***)
G00G90X[#24-[#4+#10]]Y[#25+#3]
Z#18

```

```

G01Z#26F[#9/2]
X[#24-[#4+#10]]Y#25F#9
G03X[#24-#27]Y[#25-#28]I[#4+#10]J0
G01X[#24+#21-#29]Y[#25-#30]
G03X[#24+#21-#29]Y[#25+#30]I#29J#30
G01X[#24-#27]Y[#25+#28]
G03X[#24-[#4+#10]]Y#25I#27J-#28
G01X[#24-[#4+#10]]Y[#25-#3]
GOTO80
(***DOWN-CUTTING***)
N70G00G90X[#24-[#4+#10]]Y[#25-#3]
Z#18
G01Z#26F[#9/2]
X[#24-[#4+#10]]Y#25F#9
G02X[#24-#27]Y[#25+#28]I[#4+#10]J0
G01X[#24+#21-#29]Y[#25+#30]
G02X[#24+#21-#29]Y[#25-#30]I#29J-#30
G01X[#24-#27]Y[#25-#28]
G02X[#24-[#4+#10]]Y#25I#27J#28
G01X[#24-[#4+#10]]Y[#25+#3]
(***END-OF-CYCLE***)
N80G00G90Z#18
Z#32
G#31G#33F#9
GOTO999
N990#3000=81(DATA-LACK-FOR-I.J.U.D.F.)
N991#3000=82(OFFSET-ERROR)
N992#3000=83(DATA-ERROR-FOR-C.)
N993#3000=84(RAPID-APPROACH-POINT-R.)
N994#3000=85(Z-END-POINT-Z.)
N999M99
%
```

(14) TRACK INSIDE(跑道形内轮廓) O9936



G65P9936X_Y_Z_R_I_J_U_D_F_C_S_M_)

Argument	Meaning	If omitted
X	Absolute coordination of left arc center	According to previous point
Y	Absolute coordination of left arc center	According to previous point
Z	Track bottom point Z	Alarm 3085
R	Rapid approach point R	Alarm 3084
I	Radius of left cutting arc	Alarm 3081
J	Radius of dexter cutting arc	Alarm 3081
U	Distance between the two center of arc	Alarm 3081
D	Cutter radius offset NO.	Alarm 3081
F	Feedrate	Alarm 3081
C	Approach or return circle radius	I/2
S	Approach or return feedrate	3 times of F
M	Cutting direction (M02 up cut) (M03 down cut)	M03 (down cut)

- Note :1.The values (I,J) of left arc and dexter arc cutting radius must both be larger than approach circle radius value (C) , the approach circle radius value (C) must be larger than cutter radius offset value , and the cutter radius offset value must be larger than 0 , otherwise ALARM 3082 & ALARM 3083 will occur.
- 2.The cutter radius offset value must be larger than 0 , otherwise ALARM 3082 will occur.
- 3.The cutter radius compensation (G40,G41,G42) is not used.
- 4.These commands (I,J,U,D,F,R,Z) can not be omitted , otherwise ALARM 3081, ALARM 3084, ALARM 3085 will occur.
- 5.The G65 code is effective only in the block in which it is specified.

%

```

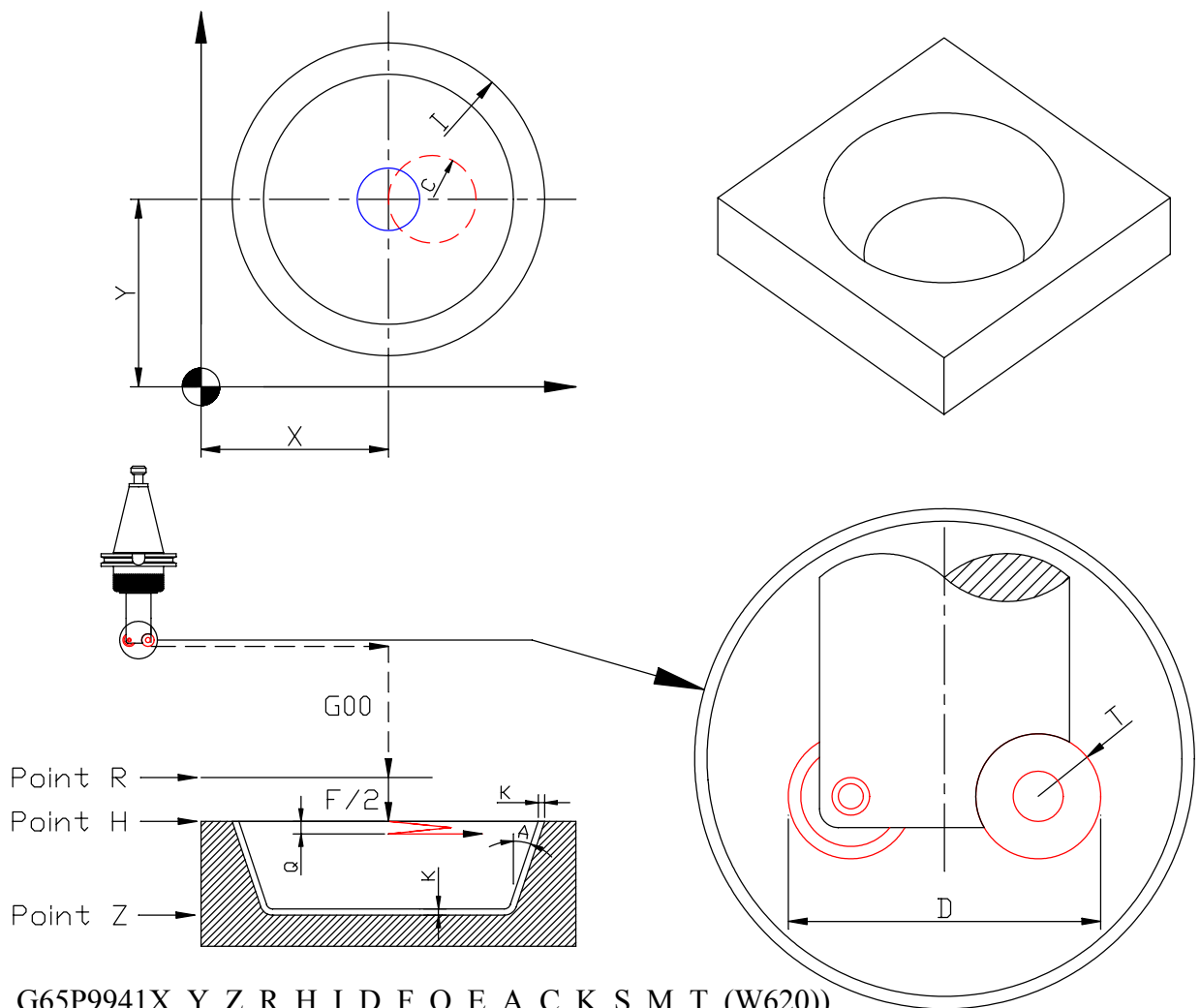
O9936(TRACK-INSIDE)
(G65P9936I-J-U-D-F-R-Z-C-S-M-X-Y-)
#31=#4001
#33=#4003
#32=#5003
IF[#24EQ#0]GOTO10
GOTO20
N10#24=#5001
N20IF[#25EQ#0]GOTO30
GOTO40
N30#25=#5002
N40IF[#18EQ#0]GOTO993(R)
IF[#26EQ#0]GOTO994(Z)
IF[#4*#5*#7*#9*#21]EQ0]GOTO990
#10=#[2200+#7]+#[2000+#7](OFFSET-B-TYPE) OR #10=#[13000+#7]+#[12000+#7](OFFSET-C-TYPE)
IF[#10LE0]GOTO991
IF[#10GT#4]GOTO991
IF[#10GT#5]GOTO991
IF[#3EQ#0]GOTO50
GOTO60
N50#3=#4/2(C=I/2)
N60IF[#3GT#4]GOTO992(C-GT-I)
IF[#10GT#3]GOTO992(D-GT-C)
IF[#19EQ#0]GOTO70
GOTO80
N70#19=3*#9
N80G00G90X#24Y#25
Z#18
G01Z#26F[#9/2]
#12=SQRT[#21*#21-[#5-#4]*[#5-#4]]

```

```

#14=ATAN[#5-#4]/[#12](ANGLE)
#27=[#4-#10]*SIN[#14](XA)
#28=[#4-#10]*COS[#14](YA)
#29=[#5-#10]*SIN[#14](XB)
#30=[#5-#10]*COS[#14](YB)
IF[#13EQ3]GOTO90
IF[#13EQ#0]GOTO90
(***UP-CUTTING***)
G01X[#24-[#4-#3]]Y[#25-[#3-#10]]F#19
G02X[#24-[#4-#10]]Y#25R[#3-#10]F#9
G02X[#24-#27]Y[#25+#28]I[#4-#10]J0
G01X[#24+#21-#29]Y[#25+#30]
G02X[#24+#21-#29]Y[#25-#30]I#29J-#30
G01X[#24-#27]Y[#25-#28]
G02X[#24-[#4-#10]]Y#25I#27J#28
G02X[#24-[#4-#3]]Y[#25+[#3-#10]]R[#3-#10]
G01X#24Y#25F#19
GOTO100
(***DOWN-CUTTING***)
N90G01X[#24-[#4-#3]]Y[#25+[#3-#10]]F#19
G03X[#24-[#4-#10]]Y#25R[#3-#10]F#9
G03X[#24-#27]Y[#25-#28]I[#4-#10]J0
G01X[#24+#21-#29]Y[#25-#30]
G03X[#24+#21-#29]Y[#25+#30]I#29J#30
G01X[#24-#27]Y[#25+#28]
G03X[#24-[#4-#10]]Y#25I#27J-#28
G03X[#24-[#4-#3]]Y[#25-[#3-#10]]R[#3-#10]
G01X#24Y#25F#19
(***END-OF-CYCLE***)
N100G00G90Z#18
Z#32
G#31G#33F#9
GOTO999
N990#3000=81(DATA-LACK-FOR-I.J.U.D.F.)
N991#3000=82(OFFSET-ERROR)
N992#3000=83(DATA-ERROR-FOR-C.)
N993#3000=84(RAPID-APPROACH-POINT-R.)
N994#3000=85(Z-END-POINT-Z.)
N999M99
%
```

(15) CIRCLE POCKET(圓錐槽) O9941

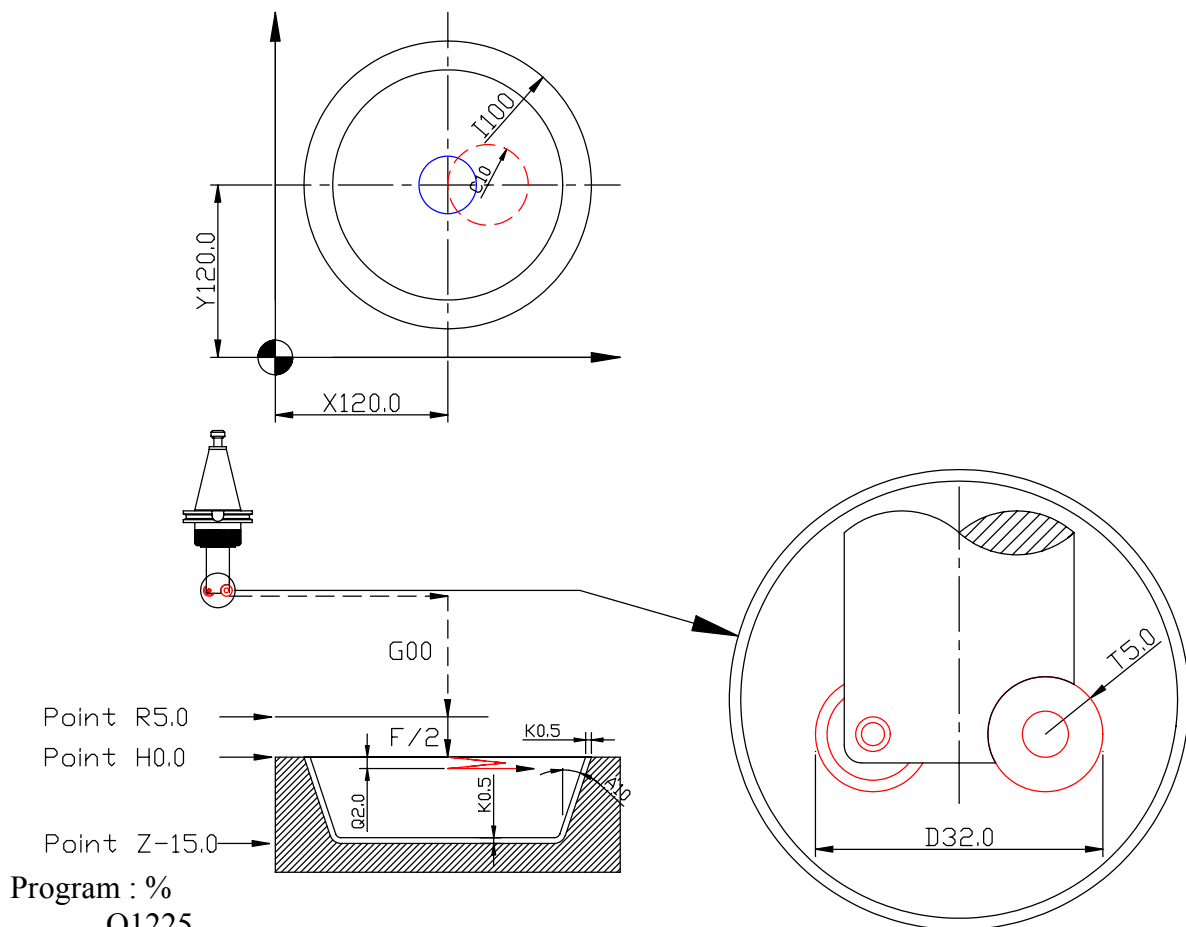


G65P9941X_Y_Z_R_H_I_D_F_Q_E_A_C_K_S_M_T_(W620))

Argument	Meaning	If omitted
X	Absolute coordination of circle center	According to previous point
Y	Absolute coordination of circle center	According to previous point
Z	Track bottom point Z	Alarm 3085
R	Rapid approach point R	Alarm 3084
H	Pocket top point H	Alarm 3091
I	Radius of circle	Alarm 3081
D	Cutter radius offset NO.	Alarm 3081
F	Feedrate	Alarm 3081
Q	Pass depth	$Q=H-Z+K$
E	The percentage of the effectual cutting width	$E=0.60$
A	Bevel	$A=0$
C	Radius of helical interpolation	$C=0$
K	Finish stock allowance	$K=0$
M	Cutting direction (M02 up cut) (M03 down cut)	M03(down cut)
S	Feedrate in helical interpolation	$S=F/4$
T	Corner radius of cutter	$T=0$
W620	Precision finish pocket command	useless

Example : Bevel circle pocket (including rough machining of pocket , precision finish bottom of pocket , and precision finish side of pocket.)

Ø32.0mm copy milling cutter D02=16.0 mm(corner radius of cutterT=5.0mm)
 Spindle speed 1406 rpm
 Feedrate 632 mm/min
 Z axis star point 50.0 mm above workpiece
 Rapid approach point R R 5.0 mm
 Z axis absolute coordination of pocket top Z 0.0
 Z end point Z -15.0
 Cutting direction M03 (down cut)



Program : %

```
O1225
G40G49G80
G00G90G54X0Y0
G43H01Z50.M3S1406
G65P9941X120.Y120.0Z-15.0R5.0H0.0I100.0 D02F632Q2.0 E0.50A10.0
      C10.0K0.5S200M03T5.0.....( Rough machining of pocket)
G65P9941X120.Y120.0Z-15.0R5.0H0.0I100.0 D02F632Q15.0 E0.50A10.0
      C10.0S200M03T5.....(Precision finish bottom of pocket)
G65P9941X120.Y120.0Z-15.0R5.0H0.0I100.0 D02F632Q0.5E0.50A10.0
      C10.0S200M03T5.0W620.....(Precision finish side of pocket.)
G80G91G28Z0
M30
%
```

Explain : When W620 be specified following after the G65P9941 , the cutting pocket macro Program will only execute finish cutting , and suppose that the rough machining has be finished before.

- Note :
- 1.The offset value of cutter radius compensation must be less than or equal to the value I , otherwise ALARM 3086 will occur.
 - 2.The sequence of altitude (R,H,Z) can not be changed , otherwise ALARM 3090 will occur.(Value $R \geq$ Value $H \geq$ Value Z)
 - 3.The percentage of effectual cutting width E can not be larger than 1.0 , otherwise ALARM 3087 will occur.
 - 4.The command I should be specified before K.
 - 5.The finishing stock allowance value K can not be larger than the value Q , otherwise ALARM 3089 will occur. (Value $[R-Z] \geq$ Value $Q \geq$ Value $K \geq 0$)
 - 6.The pass depth Q can not be larger than value of total cutting depth (Value R - Value Z) , otherwise ALARM 3088 will occur.(Value $[H-Z] \geq$ Value $Q \geq$ Value $K \geq 0$)
 - 7.The cutter offset value must be larger than 0 , otherwise ALARM 3082 will occur.
 - 8.The cutter radius compensation (G40,G41,G42) is not used.
 - 9.These commands (D,F,R,Z,H,I) can not be omitted , otherwise ALARM 3081 , ALARM 3084 , ALARM 30854 will occur.
 - 10.The G65 code is effective only in the block in which it is specified .

%

O9941(CIRCLE POCKET)

(G65P9941X-Y-Z-R-H-I-D-F-Q-E-A-C-K-M-S-W620-T-)

#31=#4001

#33=#4003

#32=#5003

IF[#24EQ#0]GOTO10

GOTO20

N10#24=#5001

N20IF[#25EQ#0]GOTO30

GOTO40

N30#25=#5002

N40IF[#18EQ#0]GOTO993(R)

IF[#26EQ#0]GOTO994(Z)

IF[[#7*#9*#4]EQ0]GOTO990

#10=#[2200+#7]+#[2000+#7](OFFSET-B-TYPE) OR #10=#[13000+#7]+#[12000+#7](OFFSET-C-TYPE)

IF[#10LE0]GOTO991

IF[#1EQ#0]GOTO50

GOTO60
N50#1=0
N60IF[#20EQ#0]GOTO70
GOTO80
N70#20=0
N80IF[#11EQ#0]GOTO989(NO-H.)
IF[#18LT#11]GOTO988(SEQUENCE-R.H.Z.)
IF[#18LT#26]GOTO988(SEQUENCE-R.H.Z.)
IF[#11LT#26]GOTO988(SEQUENCE-R.H.Z.)
IF[#10GT#4]GOTO991
IF[#3EQ#0]GOTO90
GOTO100
N90#3=0
N100IF[#8EQ#0]GOTO110
GOTO120
N110#8=0.60
N120IF[#6EQ#0]GOTO130
GOTO140
N130#6=0
N140IF[[2*#3+#10]GT[#4-#6-[#11-#26]*TAN[#1]]]GOTO992
IF[[#4-[#11-#26]*TAN[#1]]LT#10]GOTO985(A)
#26=#26+#6
#4=#4+#20*[1-COS[#1]]+#20*[1-SIN[#1]]*TAN[#1]
#4=#4-#6
#104=#4
IF[#17EQ#0]GOTO150
GOTO160
N150#17=#11-#26
N160IF[#17GT[#11-#26]]GOTO997(Q)
IF[#6GT#17]GOTO998(K)
IF[#8GT1]GOTO996(E)
IF[#19EQ#0]GOTO170
GOTO180
N170#19=#9/4
N180#29=#11-#17
D01
#4=#104
(---A-NE-0---)
#4=#104

```

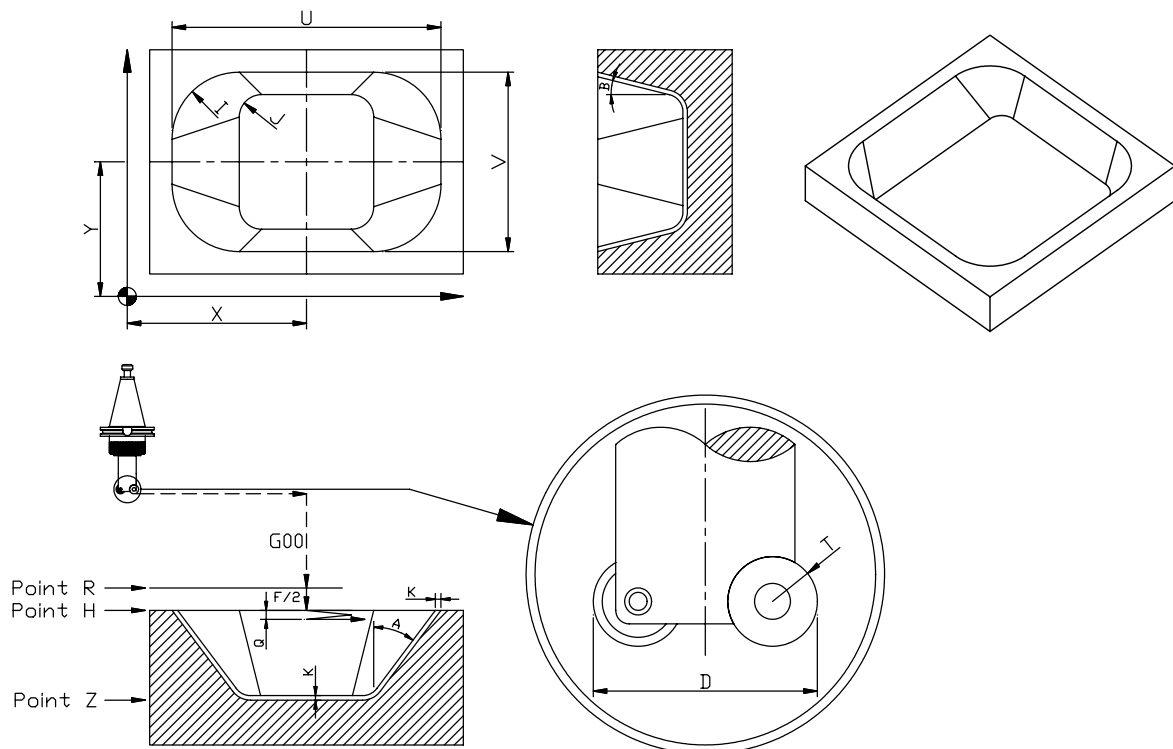
#30=#11-#29
#27=#30*TAN[#1]
#4=#4-#27
(---END---)
#12=2*#8*#10(SHARE)
#15=[#4-#10]/#12
#2=#15
#15=FIX[#15](COUNTER)
G00G90X#24Y#25
Z#18
G01Z[#29+#17]F[#9/2]
IF[#13EQ#0]GOTO201
GOTO202
N201#13=3
N202IF[#13EQ2]GOTO210
G03I#3Z#29F#19
IF[#23EQ620]GOTO1000
#100=1
WHILE[#100LE#15]DO2
G01X[#24+[#100-1]*#12-0.5]F#9
X[#24+#100*#12]F[#9/2]
G03I-[#100*#12]
X[#24+#100*#12*COS[5]]Y[#25+#100*#12*SIN[5]]R[#100*#12]
G01X[#24+#100*#12-2]Y#25
#100=#100+1
END2
IF[#2-#15]EQ0]GOTO220
N1000G01X[#24+[#4-#10]-2.5]F#9
X[#24+[#4-#10]]F[#9/2]
G03I-[#4-#10]F#9
X[#24+[#4-#10]*COS[5]]Y[#25+[#4-#10]*SIN[5]]R[#4-#10]
G01X[#24+[#4-#10]-2]Y#25
GOTO220
N210(***UP-CUTTING***)
G02I#3Z#29F#19
IF[#23EQ620]GOTO2000
#100=1
WHILE[#100LE#15]DO2
G01X[#24+[#100-1]*#12-0.5]F#9

```

```

X[#24+#100*#12][F#9/2]
G02I-[#100*#12]
X[#24+#100*#12*COS[5]]Y[#25-#100*#12*SIN[5]]R[#100*#12]
G01X[#24+#100*#12-2]Y#25
#100=#100+1
END2
IF[#2-#15]EQ0]GOTO220
N2000G01X[#24+[#4-#10]-2.5]F#9
X[#24+[#4-#10]]F[#9/2]
G02I-[#4-#10]
X[#24+[#4-#10]*COS[5]]Y[#25-[#4-#10]*SIN[5]]R[#4-#10]
G01X[#24+[#4-#10]-2]Y#25
N220
#29=#29-#17
IF[#29GE#26]GOTO300
IF[#29+#17]EQ#26]GOTO400
#29=#26
N300G00G90Z#18
Z#32
END1
N400(***END-OF-CYCLE***)
G00G90Z#18
Z#32
G#31G#33F#9
GOTO999
N985#3000=92(BEVEL-A-TOO-BIG)
N988#3000=90(SEQUENCE-ERROR-R.H.Z.)
N989#3000=91(DATA-LACK-H.)
N990#3000=81(DATA-LACK-OR-ERROR-D.F.I.)
N991#3000=82(OFFSET-ERROR)
N992#3000=83(DATA-ERROR-FOR-C.)
N993#3000=84(RAPID-APPROACH-POINT-R.)
N994#3000=85(Z-END-POINT-Z.)
N995#3000=86(CORNER-RADIUS-I.)
N996#3000=87(MODIFY-E.)
N997#3000=88(MODIFY-Q.)
N998#3000=89(MODIFY-K.)
N999M99
%
```


(16) SQUARE POCKET(四方錐槽) O9942

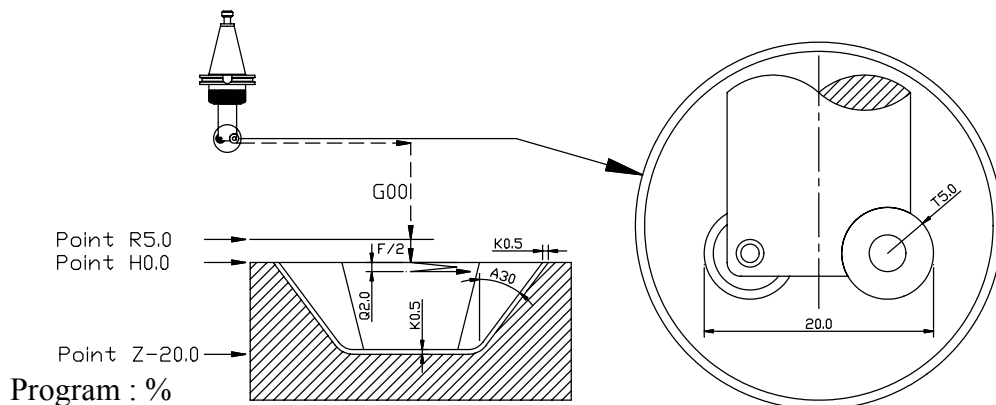
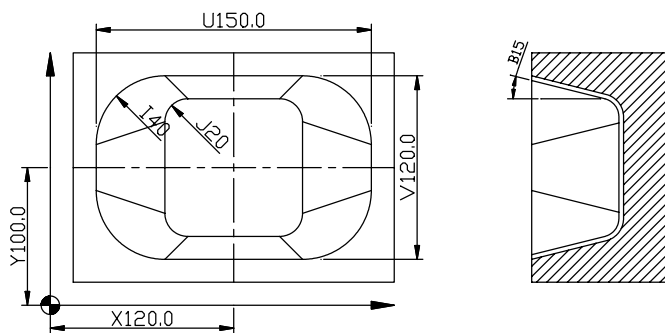


G65P9942X_Y_Z_R_H_U_V_I_J_D_F_Q_E_A_B_C_K_S_M_T_(W620))

Argument	Meaning	If omitted
X	Absolute coordination of square center	According to previous point
Y	Absolute coordination of square center	According to previous point
Z	Pocket bottom point Z	Alarm 3085
R	Rapid approach point R	Alarm 3084
H	Pocket top point H	Alarm 3091
U	Horizontal side length	Alarm 3081
V	Longitudinal side length	Alarm 3081
I	Radius of top corner arc	I= Radius of cutter
J	Radius of bottom corner arc	J= Radius of cutter
D	Cutter radius offset NO.	Alarm 3081
F	Feedrate	Alarm 3081
Q	Pass depth	Q=H-Z+K
E	The percentage of the effectual cutting width	E=0.60
A	Bevel on the XY plane	A=0
B	Bevel on the YZ plane	B=0
C	Radius of helical interpolation	C=0
K	Finish stock allowance	K=0
M	Cutting direction (M02 up cut) (M03 down cut)	M03(down cut)
S	Feedrate in helical interpolation	S=F/4
T	Corner radius of cutter	T=0
W620	Precision finish pocket command	useless

Example : Bevel square pocket (including rough machining of pocket , precision finish bottom of pocket , and precision finish side of pocket.)

Ø20.0mm copy milling cutter D02=10.0 mm(corner radius of cutterT=5.0mm)
 Spindle speed 2250 rpm
 Feedrate 450 mm/min
 Z axis star point 50.0 mm above workpiece
 Rapid approach point R R 5.0 mm
 Z axis absolute coordination of pocket top Z 0.0
 Z end point Z -20.0
 Cutting direction M03 (down cut)



Program : %

```

O1225
G40G49G80
G00G90G54X0Y0
G43H01Z50.M3S2250
G65P9942X120.Y100.0Z-20.0R5.0H0.0U150.0V120.0I40.0J20.0D02
F450.Q2.0 E0.50 A30.B15. C10.0K0.5S200M03T5.0
.....(Rough machining of pocket)
G65P9942X120.Y100.0Z-20.0R5.0H0.0U150.0V120.0I40.0J20.0D02
F450.Q20. E0.50 A30.B15. C10.0S200M03T5.0
.....(Precision finish bottom of pocket)
G65P9942X120.Y100.0Z-20.0R5.0H0.0U150.0V120.0I40.0J20.0D02
F450.Q0.5 E0.50 A30.B15. C10.0S200M03T5.0W620
.....(Precision finish side of pocket)
G80G91G28Z0
M30
%
```

Explain : When W620 be specified following after the G65P9942 , the cutting pocket macro Program will only execute finish cutting , and suppose that the rough machining has be finished before.

- Note :
- 1.The offset value of cutter radius compensation must be less than or equal to the value I , J , otherwise ALARM 3086 will occur.
 - 2.The sequence of altitude (R,H,Z) can not be changed , otherwise ALARM 3090 will occur.(Value $R \geq$ Value $H \geq$ Value Z)
 - 3.The percentage of effectual cutting width E can not be larger than 1.0 , otherwise ALARM 3087 will occur.
 - 4.The command I should be specified before K.
 - 5.The finishing stock allowance value K can not be larger than the value Q , otherwise ALARM 3089 will occur. (Value $[H-Z] \geq$ Value $Q \geq$ Value $K \geq 0$)
 - 6.The pass depth Q can not be larger than value of total cutting depth (Value R - Value Z) , otherwise ALARM 3088 will occur.(Value $[H-Z] \geq$ Value $Q \geq$ Value $K \geq 0$)
 - 7.The cutter offset value must be larger than 0 , otherwise ALARM 3082 will occur.
 - 8.The cutter radius compensation (G40,G41,G42) is not used.
 - 9.These commands (D,F,R,Z,H,U,V) can not be omitted , otherwise ALARM 3081 , ALARM 3084 , ALARM 30854 will occur.
 - 10.Corner radius of cutter must be less than value U and V.
 - 11.The G65 code is effective only in the block in which it is specified.

%

```
O9942(SQUARE POCKET)
(G65P9942X-Y-Z-R-H-U-V-I-J-D-F-Q-E-A-B-C-K-M-S-W620-T)
#31=#4001
#33=#4003
#32=#5003
IF[#24EQ#0]GOTO10
GOTO20
N10#24=#5001
N20IF[#25EQ#0]GOTO30
GOTO40
N30#25=#5002
N40IF[#18EQ#0]GOTO993(R)
IF[#26EQ#0]GOTO994(Z)
IF[[#7*#9*#21*#22]EQ0]GOTO990
IF[#21LT0]GOTO990
IF[#22LT0]GOTO990
```

```

#10=#[2200+#7]+#[2000+#7](OFFSET-B-TYPE) OR #10=#[13000+#7]+#[12000+#7](OFFSET-C-TYPE)
IF[#10LE0]GOTO991
IF[#1EQ#0]GOTO50
GOTO60
N50#1=0
N60IF[#2EQ#0]GOTO61
GOTO62
N61#2=0
N62IF[#20EQ#0]GOTO63
GOTO64
N63#20=0
N64IF[#11EQ#0]GOTO989(NO-H.)
IF[#18LT#11]GOTO988(SEQUENCE-R.H.Z.)
IF[#18LT#26]GOTO988(SEQUENCE-R.H.Z.)
IF[#11LT#26]GOTO988(SEQUENCE-R.H.Z.)
IF[#4EQ#0]GOTO70
GOTO80
N70#4=#10
N80(--ANGLE-PROTECTION--)
IF[#5EQ#0]GOTO81
GOTO82
N81#5=#4
N82IF[#10GT#4]GOTO995(D-GT-I)
IF[#10GT#5]GOTO995(D-GT-J)
IF[[#21/2-[#11-#26]*TAN[#1]]LT#5]GOTO985(A)
IF[[#22/2-[#11-#26]*TAN[#2]]LT#5]GOTO986(B)
(--OVERCUT-PROTECTION--)
IF[#4GT#5]GOTO83
GOTO84
N83#111=#24+#21/2-#4
#112=#25+#22/2-#4
#113=#24+[#21/2-[#11-#26]*TAN[#1]]-#5
#114=#25+[#22/2-[#11-#26]*TAN[#2]]-#5
#115=SQRT[[#111-#113]*[#111-#113]+[#112-#114]*[#112-#114]]
IF[#115GT[#4-#5]]GOTO987
N84(--END--)
IF[#10GT[#21/2]]GOTO991(D-GT-U/2)
IF[#10GT[#22/2]]GOTO991(D-GT-V/2)
IF[#3EQ#0]GOTO90

```

GOTO100
N90#3=0
N100IF[#8EQ#0]GOTO110
GOTO120
N110#8=0.60
N120IF[#6EQ#0]GOTO130
GOTO140
N130#6=0
N140IF[[2*#3+#10]GT[#21/2-#6-[#11-#26]*TAN[#1]]]GOTO992
IF[#3+#10]GT[#22/2-#6-[#11-#26]*TAN[#1]]]GOTO992
#106=#26
#121=[#11-#26]*TAN[#1]
#122=[#11-#26]*TAN[#2]
#123=#20*[1-COS[#1]]+#20*[1-SIN[#1]]*TAN[#1]
#124=#20*[1-COS[#2]]+#20*[1-SIN[#2]]*TAN[#2]
IF[#2EQ0]GOTO141
#126=[#121-#4+#5]*[#122+#124]/#122-#5
#128=#121+#123-#126(NEW-I#4)
#125=[#121-#4+#5]*#124/#122-#5
#127=#123-#125(NEW-J#5)
GOTO142
N141IF[#1EQ0]GOTO143
#126=[#122-#4+#5]*[#121+#123]/#121-#5
#128=#122+#124-#126(NEW-I#4)
#125=[#122-#4+#5]*#123/#121-#5
#127=#124-#125(NEW-J#5)
N142
#21=#21+2*#123
#22=#22+2*#124
#4=#128-#10
#5=#127-#10
GOTO144
N143
#4=#4-#10
#5=#5-#10
N144
#26=#26+#6
#21=#21-2*#6
#22=#22-2*#6

```

#101=#21
#102=#22
IF[#17EQ#0]GOTO150
GOTO160
N150#17=#11-#26
N160IF[#17GT[#11-#26]]GOTO997(Q)
IF[#6GT#17]GOTO998(K)
IF[#8GT1]GOTO996(E)
IF[#19EQ#0]GOTO170
GOTO180
N170#19=#9/4
N180#29=#11-#17
D01
#21=#101
#22=#102
( - -A-OR-B-NE-0- - - )
#30=#11-#29
#27=#30*TAN[#1]
#28=#30*TAN[#2]
#21=#21-2*#27
#22=#22-2*#28
( - -END- - - )
#12=2*#8*#10(LONG-AXIS-SHARE)
IF[#21LT#22]GOTO190
#15=[#21/2-#10]/#12
#116=#15
#14=[#22/2-#10]/#15(SHORT-AXIS-SHARE)
#15=FIX[#15](COUNTER)
GOTO200
N190#15=[#22/2-#10]/#12
#116=#15
#14=[#21/2-#10]/#15(SHORT-AXIS-SHARE)
#15=FIX[#15](COUNTER)
#16=#12
#12=#14
#14=#16
N200
G00G90X#24Y#25
Z#18

```

```

G01Z[#29+#17]F[#9/2]
#104=#4+[#5-#4]*[#11-#29]/[#11-#106](COR-R-SHARE)
IF[#13EQ#0]GOTO201
GOTO202
N201#13=3
N202IF[#13EQ2]GOTO210
(**DOWN-CUTTING**)
G03I#3Z#29F#19
IF[#23EQ620]GOTO1000(FINISH)
#100=1
WHILE[#100LE#15]DO2
G01X[#24+[#100-1]*#12-0.5]F#9
X[#24+#100*#12]F[#9/2]
Y[#25+0.5]
Y[#25+#100*#14],R[#100*#104/#116]F#9
X[#24-#100*#12],R[#100*#104/#116]
Y[#25-#100*#14],R[#100*#104/#116]
X[#24+#100*#12],R[#100*#104/#116]
Y[#25+2]
X[#24+#100*#12-2]Y#25
#100=#100+1
END2
IF[#116-#15]EQ0]GOTO220
N1000
G01X[#24+#21/2-#3-#10]Y[#25-#3]F#9
G03X[#24+#21/2-#10]Y#25R#3F[#9/2]
G01Y[#25+0.5]
Y[#25+[#22/2-#10]-#104-0.5]F#9
Y[#25+[#22/2-#10]],R#104F[#9/2]
X[#24+[#21/2-#10]-#104-0.5]
X[#24-[#21/2-#10]+#104+0.5]F#9
X[#24-[#21/2-#10]],R#104F[#9/2]
Y[#25+[#22/2-#10]-#104-0.5]
Y[#25-[#22/2-#10]+#104+0.5]F#9
Y[#25-[#22/2-#10]],R#104F[#9/2]
X[#24-[#21/2-#10]+#104+0.5]
X[#24+[#21/2-#10]-#104-0.5]F#9
X[#24+[#21/2-#10]],R#104F[#9/2]
Y[#25-[#22/2-#10]+#104+0.5]

```

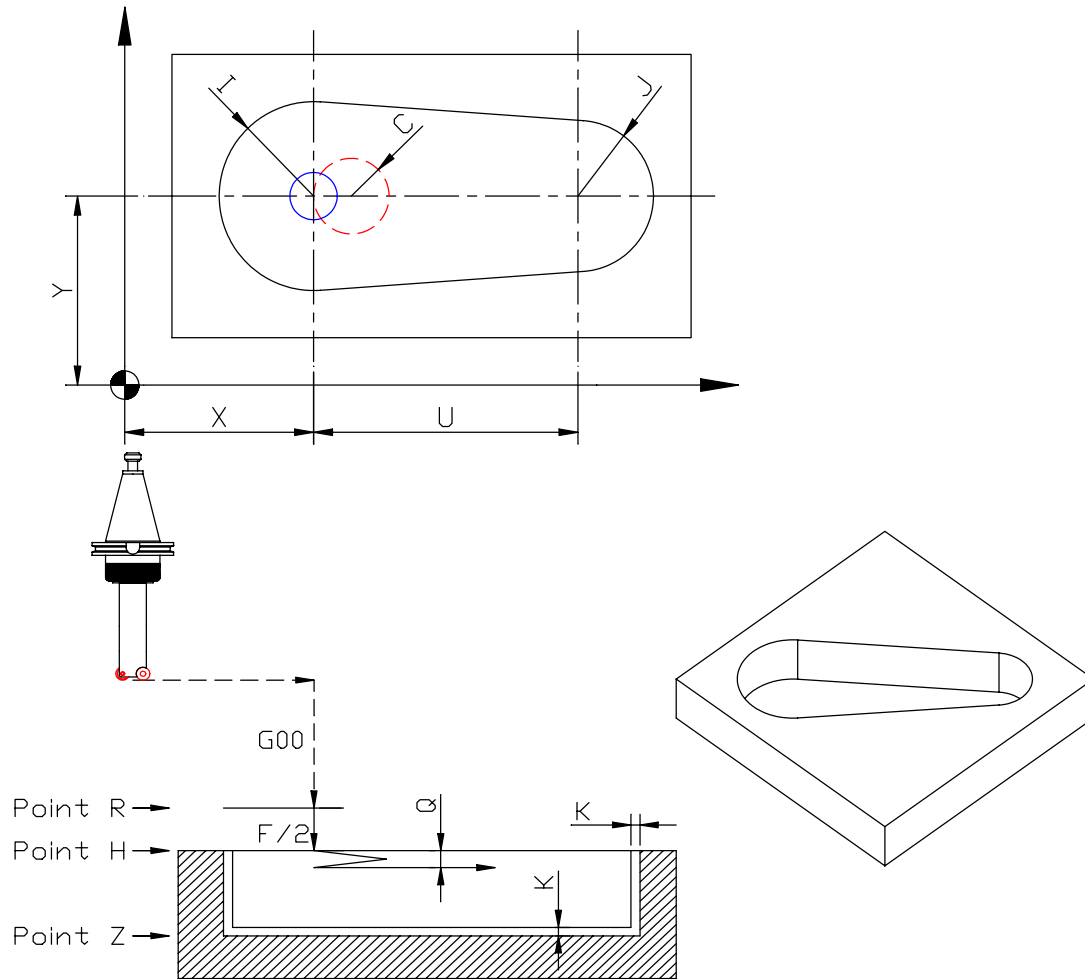
```

Y[#25-0.5]F#9
Y#25F[#9/2]
G03X[#24+#21/2-#3-#10]Y[#25+#3]R#3
X[#24+[#21/2-#10]-2]Y#25
GOTO220
N210(***UP-CUTTING***)
G02I#3Z#29F#19
IF[#23EQ620]GOTO2000
#100=1
WHILE[#100LE#15]DO2
G01X[#24+[#100-1]*#12-0.5]F#9
X[#24+#100*#12]F[#9/2]
Y[#25-0.5]
Y[#25-#100*#14],R[#100*#104/#116]F#9
X[#24-#100*#12],R[#100*#104/#116]
Y[#25+#100*#14],R[#100*#104/#116]
X[#24+#100*#12],R[#100*#104/#116]
Y[#25-2]
X[#24+#100*#12-2]Y#25
#100=#100+1
END2
IF[#116-#15]EQ0]GOTO220
N2000G01X[#24+#21/2-#3-#10]Y[#25+#3]F#9
G02X[#24+#21/2-#10]Y#25R#3F[#9/2]
G01Y[#25-0.5]
Y[#25-[#22/2-#10]+#104+0.5]F#9
Y[#25-[#22/2-#10]],R#104F[#9/2]
X[#24+[#21/2-#10]-#104-0.5]
X[#24-[#21/2-#10]+#104+0.5]F#9
X[#24-[#21/2-#10]],R#104F[#9/2]
Y[#25-[#22/2-#10]+#104+0.5]
Y[#25+[#22/2-#10]-#104-0.5]F#9
Y[#25+[#22/2-#10]],R#104F[#9/2]
X[#24-[#21/2-#10]+#104+0.5]
X[#24+[#21/2-#10]-#104-0.5]F#9
X[#24+[#21/2-#10]],R#104F[#9/2]
Y[#25+[#22/2-#10]-#104-0.5]
Y[#25+0.5]F#9
Y#25F[#9/2]

```


G02X[#24+#21/2-#3-#10]Y[#25-#3]R#3
X[#24+[#21/2-#10]-2]Y#25
N220
#29=#29-#17
IF[#29GE#26]GOTO300
IF[#29+#17]EQ#26]GOTO400
#29=#26
N300G00G90Z#18
Z#32
END1
N400(***END-OF-CYCLE***)
G00G90Z#18
Z#32
G#31G#33F#9
GOTO999
N985#3000=92(BEVEL-A-TOO-BIG)
N986#3000=93(BEVEL-B-TOO-BIG)
N987#3000=94(OVERCUTTING-IN-CORNER)
N988#3000=90(SEQUENCE-ERROR-R.H.Z.)
N989#3000=91(DATA-LACK-H.)
N990#3000=81(DATA-LACK-OR-ERROR-D.F.U.V.)
N991#3000=82(OFFSET-ERROR)
N992#3000=83(DATA-ERROR-FOR-C.)
N993#3000=84(RAPID-APPROACH-POINT-R.)
N994#3000=85(Z-END-POINT-Z.)
N995#3000=86(CORNER-RADIUS-I.J.)
N996#3000=87(MODIFY-E.)
N997#3000=88(MODIFY-Q.)
N998#3000=89(MODIFY-K.)
N999M99
%

(17) TRACK POCKET(跑道形槽) O9943

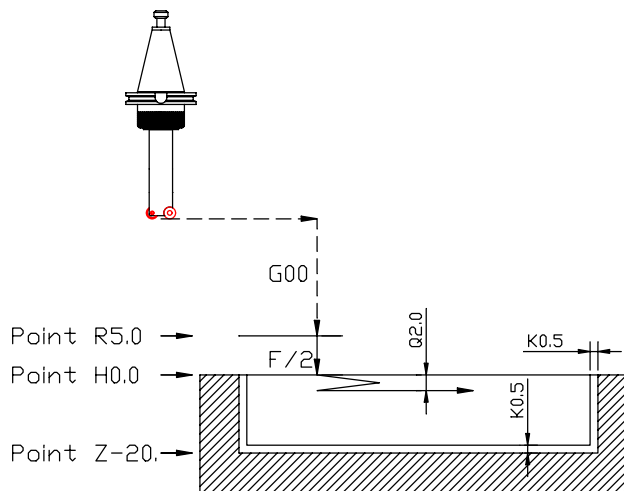
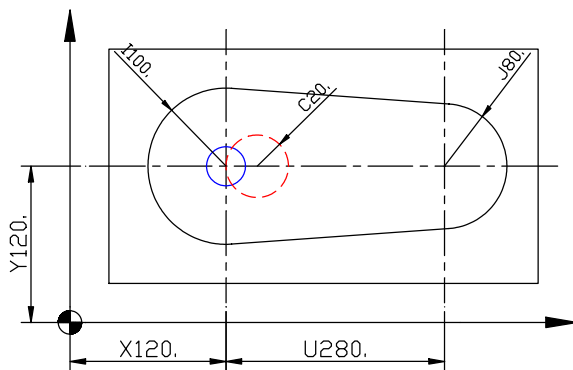


G65P9943X_Y_Z_R_H_I_J_U_D_F_Q_E_C_K_S_M_)

Argument	Meaning	If omitted
X	Absolute coordination of circle center	According to previous point
Y	Absolute coordination of circle center	According to previous point
Z	Pocket bottom point Z	Alarm 3085
R	Rapid approach point R	Alarm 3084
H	Pocket top point H	Alarm 3091
I	Radius of left cutting arc	Alarm 3081
J	Radius of dexter cutting arc	Alarm 3081
U	Distance between the two center of arc	Alarm 3081
D	Cutter radius offset NO.	Alarm 3081
F	Feedrate	Alarm 3081
Q	Pass depth	$Q=H-Z+K$
E	The percentage of the effectual cutting width	$E=0.60$
C	Radius of helical interpolation	$C=0$
K	Finish stock allowance	$K=0$
M	Cutting direction (M02 up cut) (M03 down cut)	M03(down cut)
S	Feedrate in helical interpolation	$S=F/4$

Example : Track pocket

Ø32.0mm copy milling cutter D02=16.0 mm(corner radius of cutterT=5.0mm)
 Spindle speed 1406 rpm
 Feedrate 632 mm/min
 Z axis star point 50.0 mm above workpiece
 Rapid approach point R R 5.0 mm
 Z axis absolute coordination of pocket top Z 0.0
 Z end point Z -20.0
 Cutting direction M03 (down cut)



Program : %

```

O1225
G40G49G80
G00G90G54X0Y0
G43H01Z50.M3S1406
G65P9943X120.Y120.0Z-20.0R5.0H0.0I100.0J80.0 U280.D02F632Q2.0
      E0.50 C20.0K0.5S200M03.....(Rough machining of pocket)
G80G91G28Z0
M30
%
```

- Note :1.The offset value of cutter radius compensation must be less than or equal to the value I , J , otherwise ALARM 3086 will occur.
- 2.The sequence of altitude (R,H,Z) can not be changed , otherwise ALARM 3090 will occur.(Value R \geq Value H \geq Value Z)
- 3.The percentage of effectual cutting width E can not be larger than 1.0 , otherwise ALARM 3087 will occur.
- 4.The command I should be specified before K.
- 5.The finishing stock allowance value K can not be larger than the value Q , otherwise ALARM 3089 will occur. (Value [H-Z] \geq Value Q \geq Value K \geq 0)
- 6.The pass depth Q can not be larger than value of total cutting depth (Value R- Value Z) , otherwise ALARM 3088 will occur.(Value [H-Z] \geq Value Q \geq Value K \geq 0)
- 7.The cutter offset value must be larger than 0 , otherwise ALARM 3082 will occur.
- 8.The cutter radius compensation (G40,G41,G42) is not used.
- 9.These commands (D,F,R,Z,H,I,J,U) can not be omitted , otherwise ALARM 3081 , ALARM 3084 , ALARM 30854 will occur.
- 10.The value U can not be minus.
- 11.The G65 code is effective only in the block in which it is specified.

%

O9943(TRACK-POCKET)

(G65P9943X-Y-Z-R-H-I-J-U-D-F-Q-E-C-K-M-S-)

#31=#4001

#33=#4003

#32=#5003

IF[#24EQ#0]GOTO10

GOTO20

N10#24=#5001

N20IF[#25EQ#0]GOTO30

GOTO40

N30#25=#5002

N40IF[#18EQ#0]GOTO993(R)

IF[#26EQ#0]GOTO994(Z)

IF[[#7*#9*#21*#4*#5]EQ0]GOTO990

#10=#[2200+#7]+#[2000+#7](OFFSET-B-TYPE) OR #10=#[13000+#7]+#[12000+#7](OFFSET-C-TYPE)

IF[#10LE0]GOTO991

IF[#11EQ#0]GOTO989(NO-H.)

IF[#18LT#11]GOTO988(SEQUENCE-R.H.Z.)

IF[#18LT#26]GOTO988(SEQUENCE-R.H.Z.)

```

IF[#11LT#26]GOTO988(SEQUENCE-R.H.Z.)
IF[#10GT#4]GOTO991
IF[#10GT#5]GOTO991
IF[#3EQ#0]GOTO90
GOTO100
N90#3=0
N100IF[#8EQ#0]GOTO110
GOTO120
N110#8=0.60
N120IF[#6EQ#0]GOTO130
GOTO140
N130#6=0
N140IF[[2*#3+#10]GT[#4-#6]]GOTO992
#26=#26+#6
#4=#4-#6
#5=#5-#6
IF[#17EQ#0]GOTO150
GOTO160
N150#17=#11-#26
N160IF[#17GT[#11-#26]]GOTO997(Q)
IF[#6GT#17]GOTO998(K)
IF[#8GT1]GOTO996(E)
IF[#19EQ#0]GOTO170
GOTO180
N170#19=#9/4
N180#16=#11-#17
DO1
#12=2*#8*#10(LONG-AXIS-SHARE)
IF[#4LT#5]GOTO190
#15=[#4-#10]/#12
#2=#15
#14=[#5-#10]/#15(SHORT-AXIS-SHARE)
#15=FIX[#15](COUNTER)
GOTO200
N190#15=[#5-#10]/#12
#2=#15
#14=[#4-#10]/#15(SHORT-AXIS-SHARE)
#15=FIX[#15](COUNTER)
#101=#12

```

```

#12=#14
#14=#101
N200
G00G90X#24Y#25
Z#18
G01Z[#16+#17]F[#9/2]
IF[#13EQ#0]GOTO201
GOTO202
N201#13=3
N202IF[#13EQ2]GOTO210
(***DOWN-CUTTING***)
G03I#3Z#16F#19
G01X[#24+#21]F#9
#100=1
WHILE[#100LE#15]DO2
#104=#100*#12
#105=#100*#14
#22=SQRT[#21*#21-[#105-#104]*[#105-#104]]
#23=ATAN[#105-#104]/[#22](ANGLE)
#27=#104*SIN[#23](XA)
#28=#104*COS[#23](YA)
#29=#105*SIN[#23](XB)
#30=#105*COS[#23](YB)
G01X[#24+#21+#100*#14]F#9
G03X[#24+#21-#29]Y[#25+#30]I-#105
G01X[#24-#27]Y[#25+#28]
G03X[#24-#27]Y[#25-#28]I#27J-#28
G01X[#24+#21-#29]Y[#25-#30]
G03X[#24+#21+#100*#14]Y0I#29J#30
X[#24+#21+[#100*#14]*COS[5]]Y[#25+#100*#14*SIN[5]]R[#100*#14]
G01X[#24+#21+[#100*#14]-2]Y#25
#100=#100+1
END2
IF[#2-#15]EQ0]GOTO220
#22=SQRT[#21*#21-[#5-#4]*[#5-#4]]
#23=ATAN[#5-#4]/[#22](ANGLE)
#27=[#4-#10]*SIN[#23](XA)
#28=[#4-#10]*COS[#23](YA)
#29=[#5-#10]*SIN[#23](XB)

```

```

#30=[#5-#10]*COS[#23](YB)
G01X[#24+#21+[#5-#10]]F#9
G03X[#24+#21-#29]Y[#25+#30]I-[#5-#10]
G01X[#24-#27]Y[#25+#28]
G03X[#24-#27]Y[#25-#28]I#27J-#28
G01X[#24+#21-#29]Y[#25-#30]
G03X[#24+#21+[#5-#10]]Y0I#29J#30
X[#24+#21+[#5-#10]*COS[5]]Y[#25+[#5-#10]*SIN[5]]R[#5-#10]
G01X[#24+#21+[#5-#10]-2]Y#25
GOTO220
N210(***UP-CUTTING***)
G02I#3Z#16F#19
#100=1
WHILE[#100LE#15]DO2
#104=#100*#12
#105=#100*#14
#22=SQRT[#21*#21-[#105-#104]*[#105-#104]]
#23=ATAN[#105-#104]/[#22](ANGLE)
#27=#104*SIN[#23](XA)
#28=#104*COS[#23](YA)
#29=#105*SIN[#23](XB)
#30=#105*COS[#23](YB)
G01X[#24+#21+#100*#14]F#9
G02X[#24+#21-#29]Y[#25-#30]I-#105
G01X[#24-#27]Y[#25-#28]
G02X[#24-#27]Y[#25+#28]I#27J#28
G01X[#24+#21-#29]Y[#25+#30]
G02X[#24+#21+#100*#14]Y0I#29J-#30
X[#24+#21+[#100*#14]*COS[5]]Y[#25-#100*#14*SIN[5]]R[#100*#14]
G01X[#24+#21+[#100*#14]-2]Y#25
#100=#100+1
END2
IF[#2-#15]EQ0]GOTO220
#22=SQRT[#21*#21-[#5-#4]*[#5-#4]]
#23=ATAN[#5-#4]/[#22](ANGLE)
#27=[#4-#10]*SIN[#23](XA)
#28=[#4-#10]*COS[#23](YA)
#29=[#5-#10]*SIN[#23](XB)
#30=[#5-#10]*COS[#23](YB)

```

G01X[#24+#21+[#5-#10]]F#9
G02X[#24+#21-#29]Y[#25-#30]I-[#5-#10]
G01X[#24-#27]Y[#25-#28]
G02X[#24-#27]Y[#25+#28]I#27J#28
G01X[#24+#21-#29]Y[#25+#30]
G02X[#24+#21+[#5-#10]]Y0I#29J-#30
X[#24+#21+[#5-#10]*COS[5]]Y[#25-[#5-#10]*SIN[5]]R[#5-#10]
G01X[#24+#21+[#5-#10]-2]Y#25
N220
#16=#16-#17
IF[#16GE#26]GOTO300
IF[#16+#17]EQ#26]GOTO400
#16=#26
N300G00G90Z#18
Z#32
END1
N400(***END-OF-CYCLE***)
G00G90Z#18
Z#32
G#31G#33F#9
GOTO999
N988#3000=90(SEQUENCE-ERROR-R.H.Z.)
N989#3000=91(DATA-LACK-H.)
N990#3000=81(DATA-LACK-FOR-D.F.I.J.U.)
N991#3000=82(OFFSET-ERROR)
N992#3000=83(DATA-ERROR-FOR-C.)
N993#3000=84(RAPID-APPROACH-POINT-R.)
N994#3000=85(Z-END-POINT-Z.)
N995#3000=86(CORNER-RADIUS-I.)
N996#3000=87(MODIFY-E.)
N997#3000=88(MODIFY-Q.)
N998#3000=89(MODIFY-K.)
N999M99
%