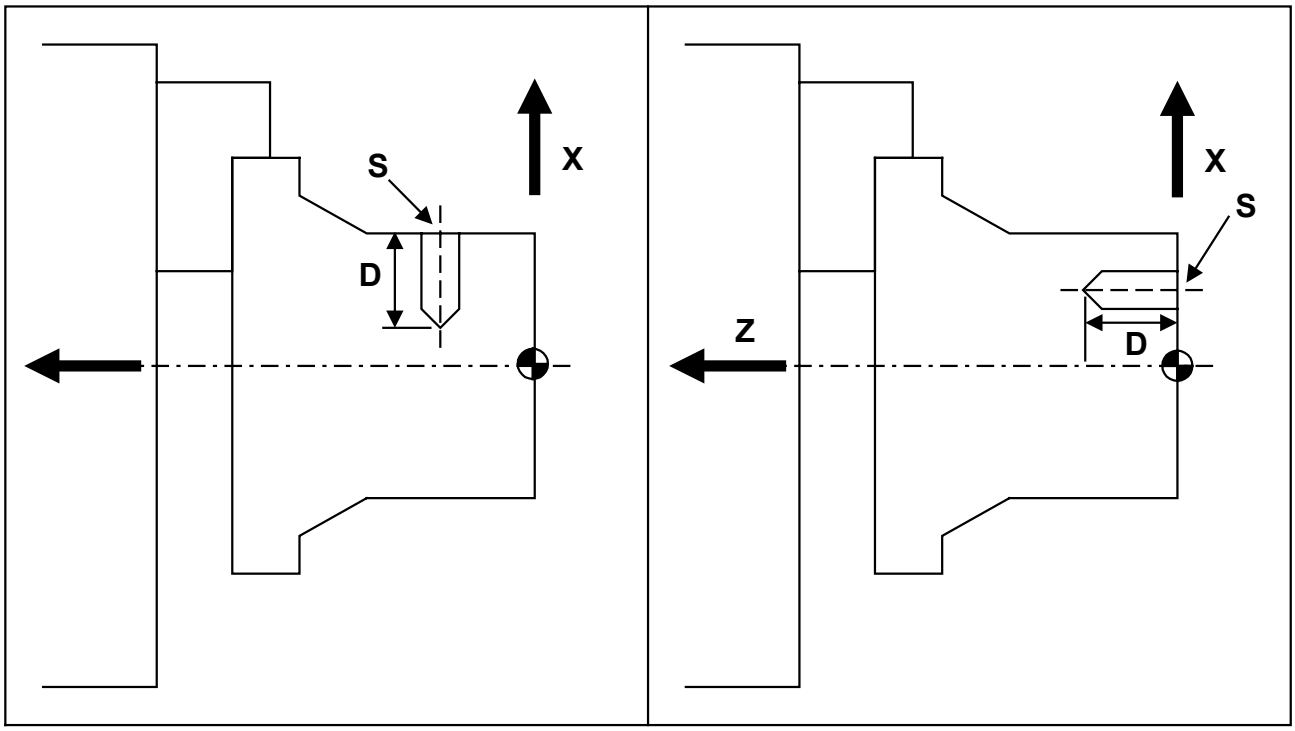
MILLING UNIT INFORMATION

MDR OUT **MDR FCE**



POINTS TO NOTE

1. The control automatically positions the tool clear of the material by a clearance amount set in parameters.

2. Positions to the right of Z zero are defined as negative z co-ordinates.

3. When using the "BOTTOMED" drill cycles, the programmed depth is based on the depth of the drill point in the material.

4. When using the "THROUGH" drill cycles, the programmed depth is based on the full diameter drilling depth - material length. The control automatically allows for the extra drilling depth by refering to the TOOL DATA page (for the drilling point allowance), and to a parameter, for the through clearance.

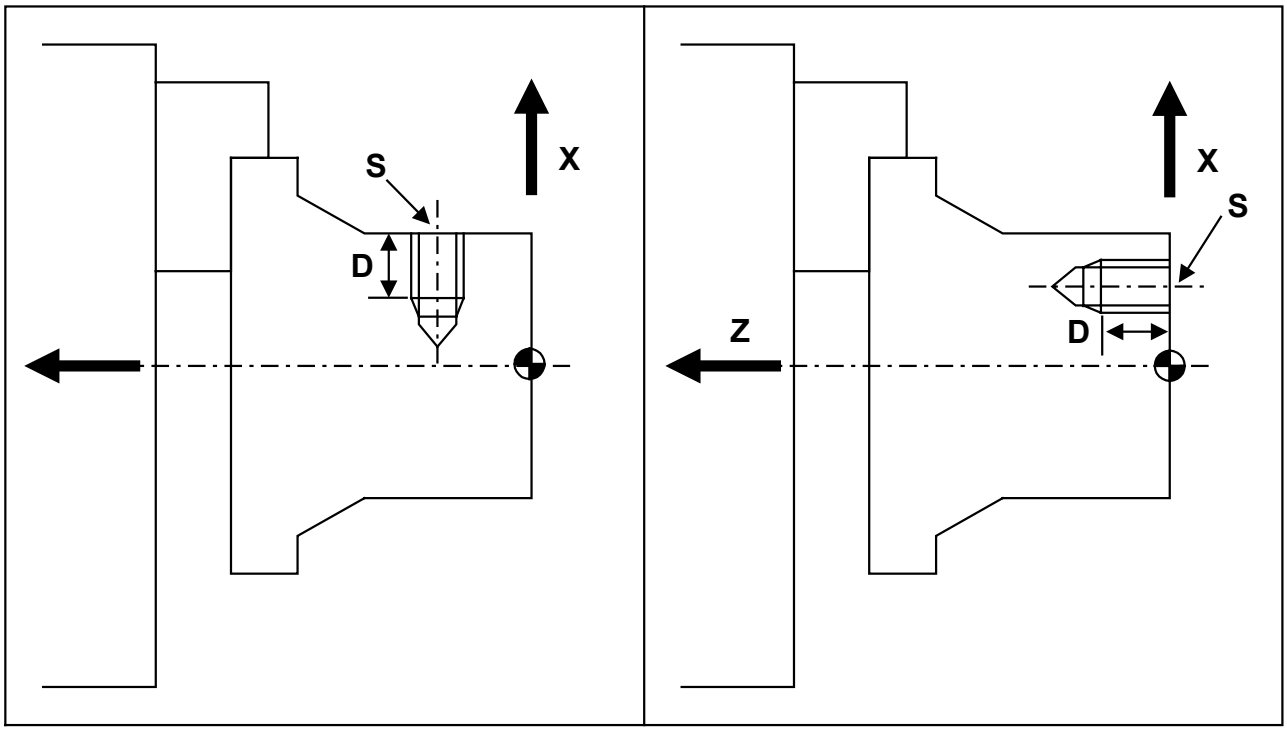
5. Feedrates at the start and finish of the drilling can be altered by parameters.

6. Cycle Types: #0 = peck,feed retract. #1 = peck, chip clear.
#2 = peck,chipbreak. #3 = ream. #4 = #1 & #2 combination.

NB. S = starting point. D = depth.

MTP OUT

MTP FCE



POINTS TO NOTE

1. The control automatically positions the tool clear of the material by a clearance amount set in a parameter.

2. Positions to the right of Z zero are defined as negative Z co- ordinates.

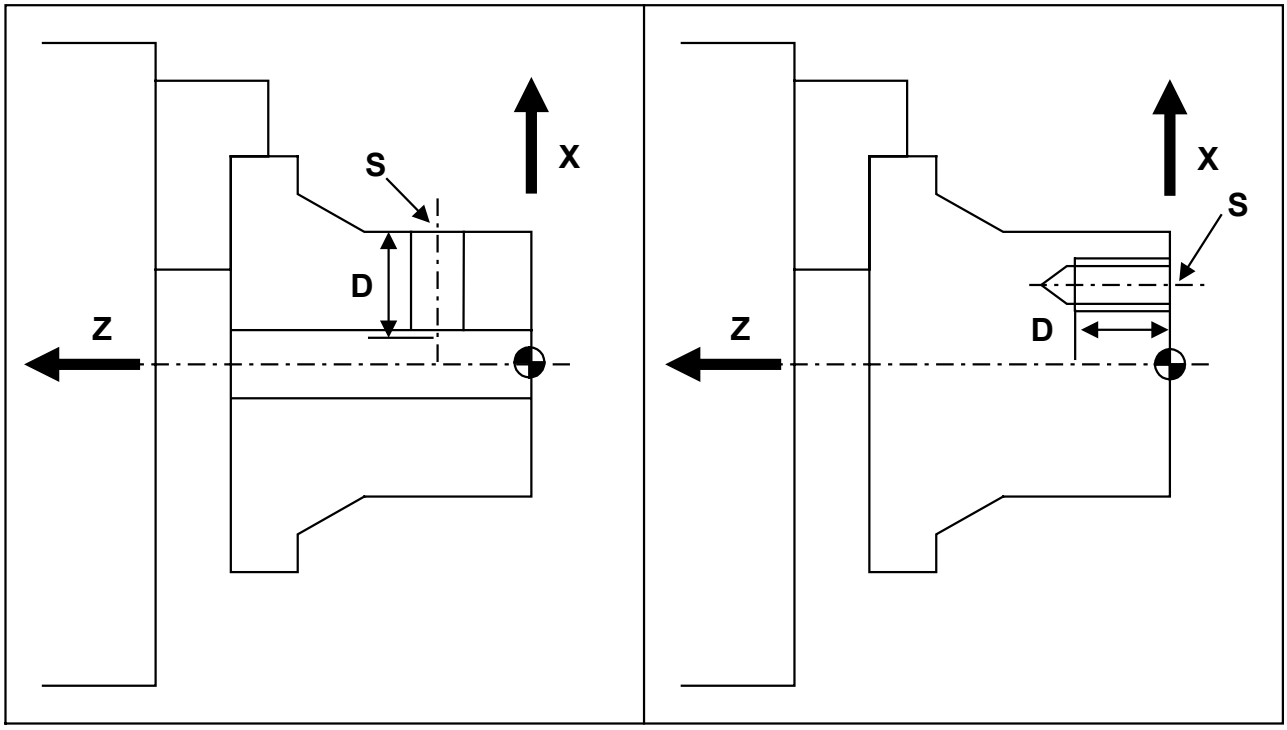
3. The actual depth in the program is based on the full thread length.

4. The control automaticlly allows for the taper lead section of the tap by a parameter setting.

5. The control automatically allows for the taper elongation when retracting, by a parameter setting.

NB. S = starting point. D = depth.

BOR OUT **BOR FCE**



POINTS TO NOTE

1. The control automatically positions the tool clear of the material by a clearance amount set in a parameter.

2. Positions to the right of the Z zero are defined as negative z co-ordinates.

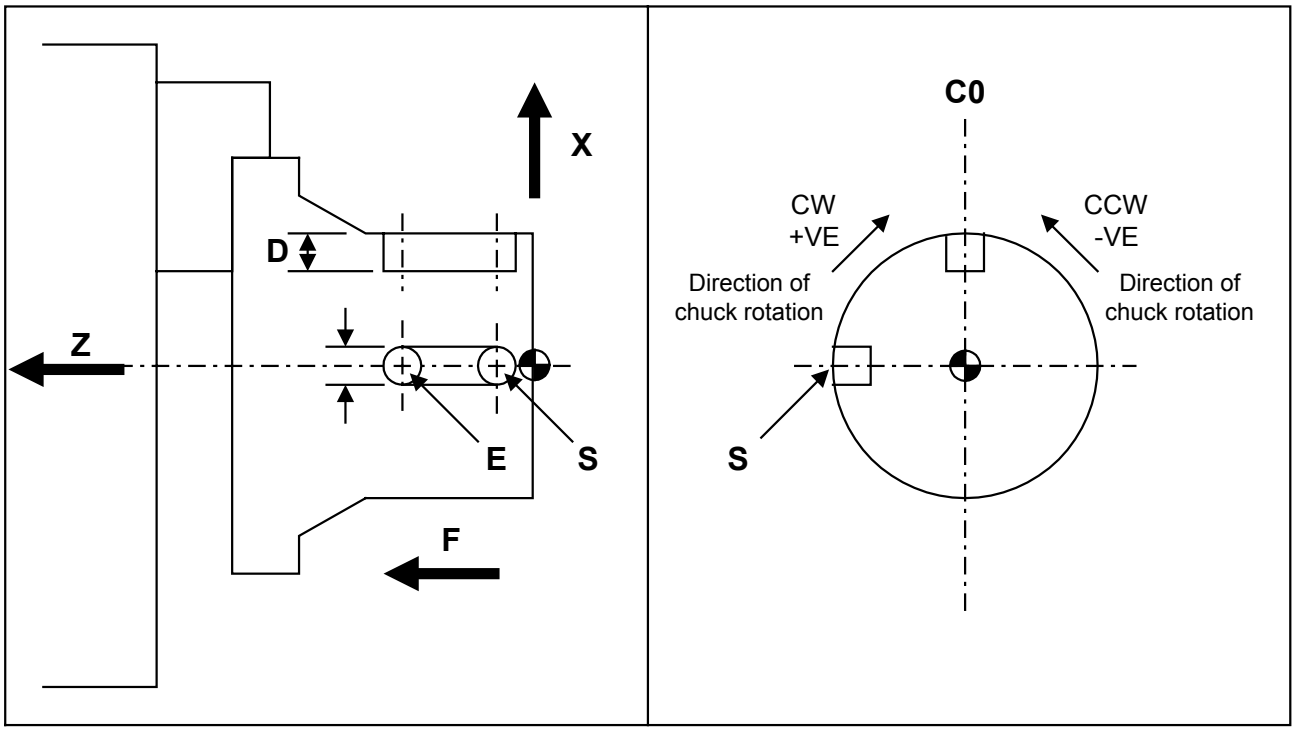
3. The actual depth in the program is based on the tool boring depth. Therefore, allowances must be included if the tool is boring through.

4. For INTEGREX type machines, spindle orientation, and tool tip relief are possible, but only when the tool is mounted horizontally.

5. Cycle types: #0 = Feed in, Feed out.
#1 = Feed in, Orient mill spindle (Integrex type m/c only), Rapid out.
#2 = Feed in, Orient mill spindle, Tool retract, (Integrex type m/c only), Rapid out.

N.B S = Starting point, D = Depth.

MGV OUT



POINTS TO NOTE

1. The control automatically positions the tool clear of the material by clearance amounts set in parameters.

2. Positions to the right of the Z zero, are defined as negative Z co-ordinates.

3. The center line detail of the MGV feature must be a straight line parallel to the Z axis, and pass through the component center line.(Non Y axis machines.)

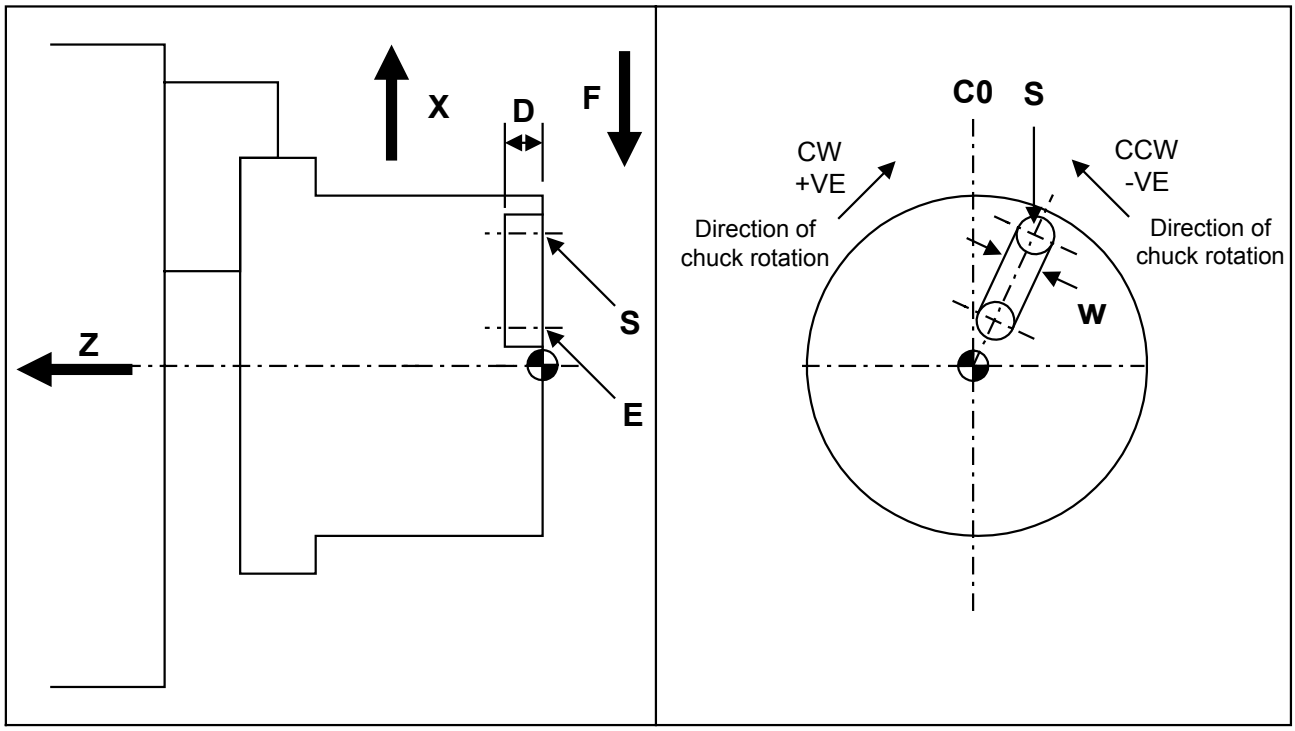
4. The finish tool diameter must be equal to the required slot width.
(Non Y axis machines.)

5. While cutting, the C axis is clamped.

6. Cutting patterns: #0 = Uni-directional. #1 = Bi-directional.
#2 = CW cut.* #3 = CCW cut.*
(*) For Y axis machines only, and for these cycles, Wall Fin Allowance = Axial Fin Allowance.

N.B S=Start point, E=Final point, D=Depth, W=Width, F=Main feed direction.
(Start pt, Final pt and Main feed directions can be reversed.)

MGV FCE



POINTS TO NOTE

1. The control automatically positions the tool clear of the material by clearance amounts set in parameters.

2. Positions to the right of the Z zero are defined as negative Z co-ordinates.

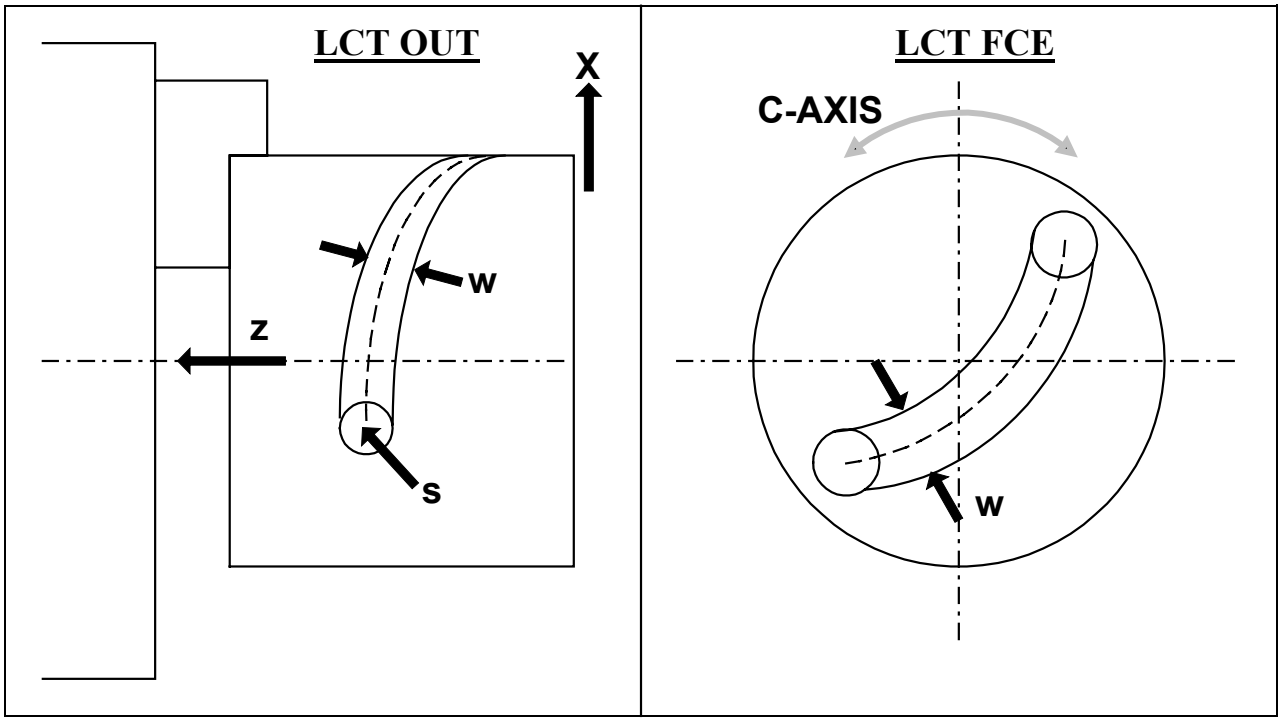
3. The **centre line** detail of the MGV feature, must be a straight line on the face of the componant, and must pass through the componant centre.

4. The finish tool diameter must be equal to the required slot width.

5. While cutting, the C axis is clamped.

6. Cutting patterns: #0 = Uni-directional. #1 = Bi-directional.

N.B S = Start point. E = Final point. D = Depth. W = Width. F = Main feed direction.
(Start pt, Final pt and Main feed direction, can be reversed).



POINTS TO NOTE:

1. The control automatically positions the tool clear of the material by clearance amounts set in parameters.

2. Positions to the right of Z zero are defined as negative Z co-ordinates.

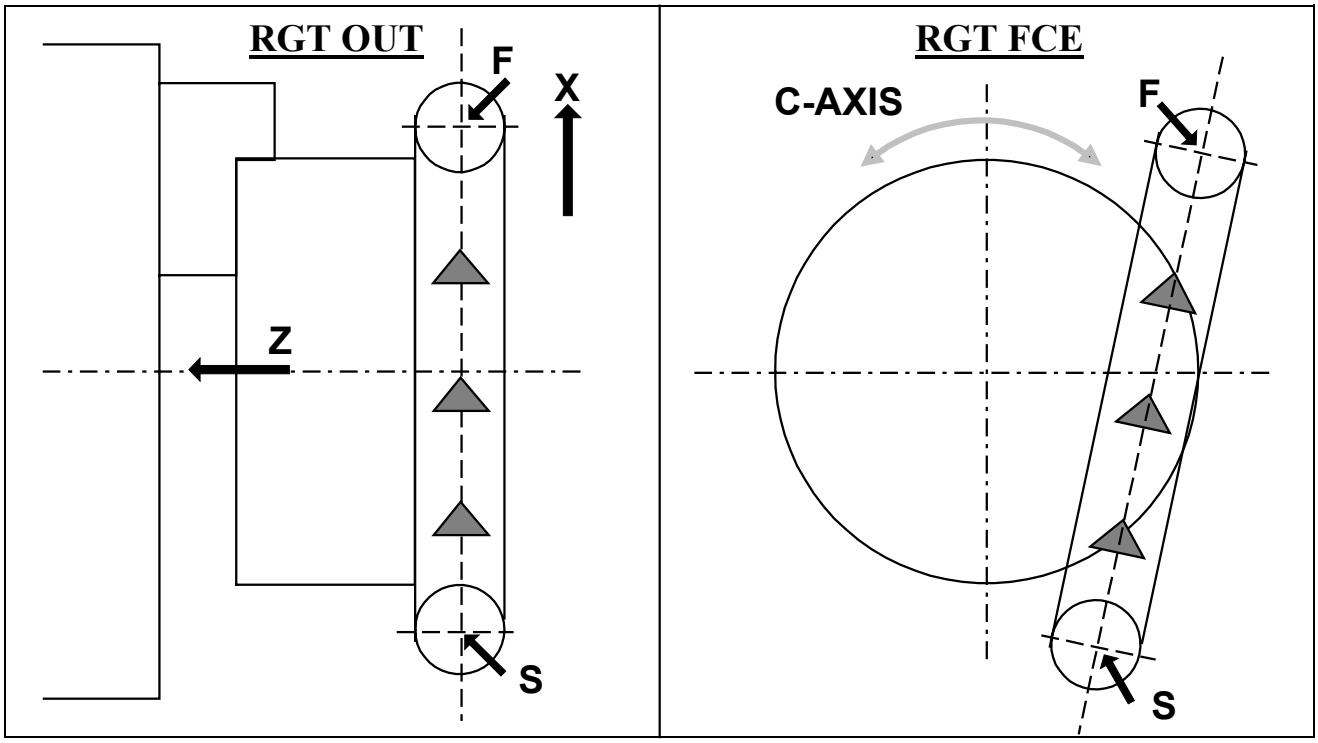
3. This process positions the cutter centre ON the line defined.

4. While machining using a LCT OUT unit, once a desired cut radius has been set the machine uses Z-Axis and C-Axis (or Y-Axis, with option) to produce the profile.

5. While machining using a LCT FCE unit, once a desired cut radius has been set the machine uses X-Axis and C-Axis (or Y-Axis, with option) to produce the profile.

6. Initial positioning of the cutter must be specified by START POINT before profiling of the feature begins.

N.B. W= width of groove



POINTS TO NOTE:

1. The control automatically positions the tool clear of the material by clearance amount set in parameters.

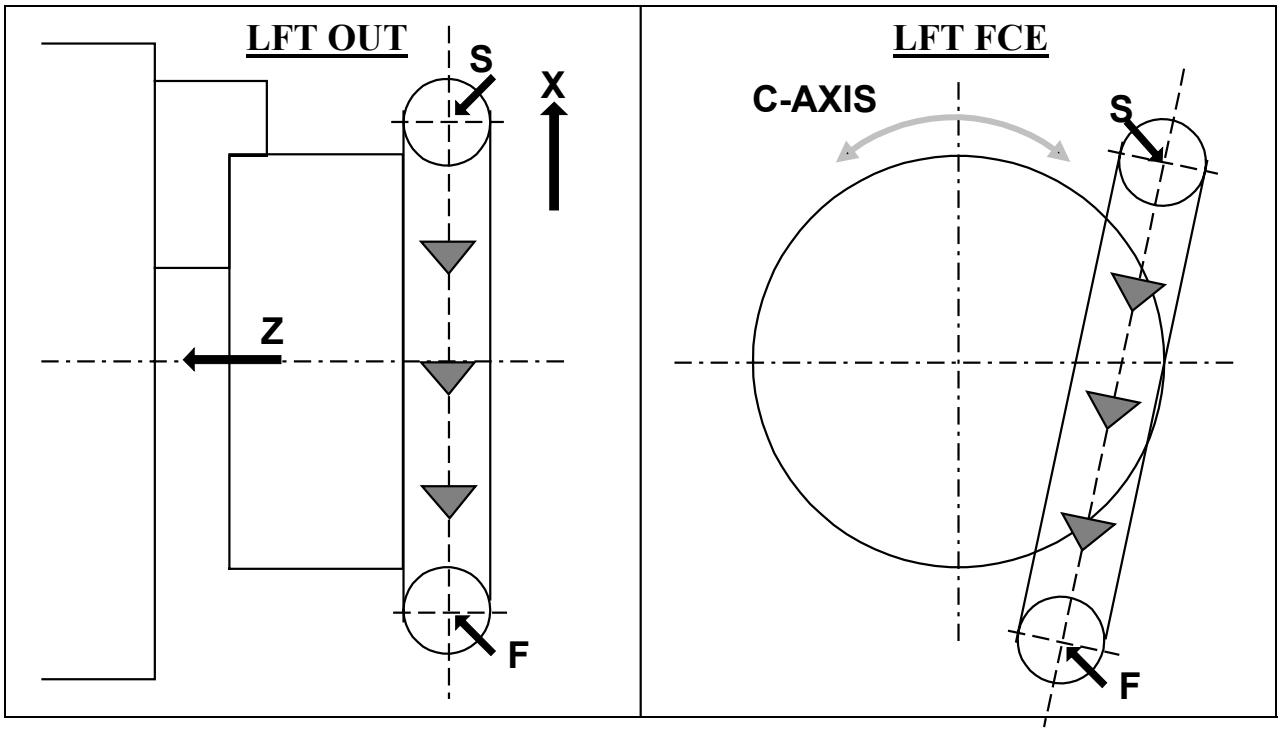
2. Positions to the right of Z zero are defined as negative Z co-ordinates.

3. This process positions the cutter to the right-hand side of the line defined.

4. While machining using a RGT OUT unit, once a desired cut radius has been set the machine uses Z-Axis and C-Axis (or Y-axis, with option) to produce the profile.

5. While machining using a RGT FCE unit, once a final point in Z-Axis has been set the machine uses X-Axis and C-Axis (or Y-axis, with option) to produce the profile.

6. Initial positioning of the cutter must be specified by START POINT before profiling of the feature begins.



POINTS TO NOTE:

1. The control automatically positions the tool clear of the material by clearance amounts set in parameters

2. Positions to the right of the Z zero are defined as negative Z co-ordinates.

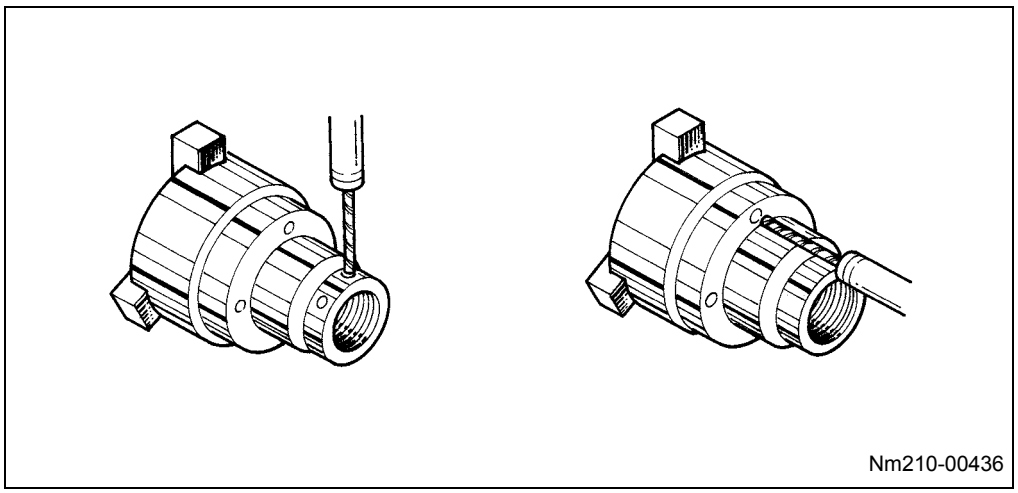
3. This process positions the cutter to the left-hand side of the line defined.

4. While machining using a LFT OUT unit, once a desired cut radius has been set the machine uses Z-Axis and C-Axis (or Y-Axis, with option) to produce the profile.

5. While machining using a LFT FCE unit, once a desired cut radius has been set the machine uses X-Axis and C-Axis (or Y-Axis, with option) to produce the profile.

6. Initial positioning of the cutter must be specified by START POINT before profiling of the feature begins.

NOTES RELATING TO MDR/MTP UNIT

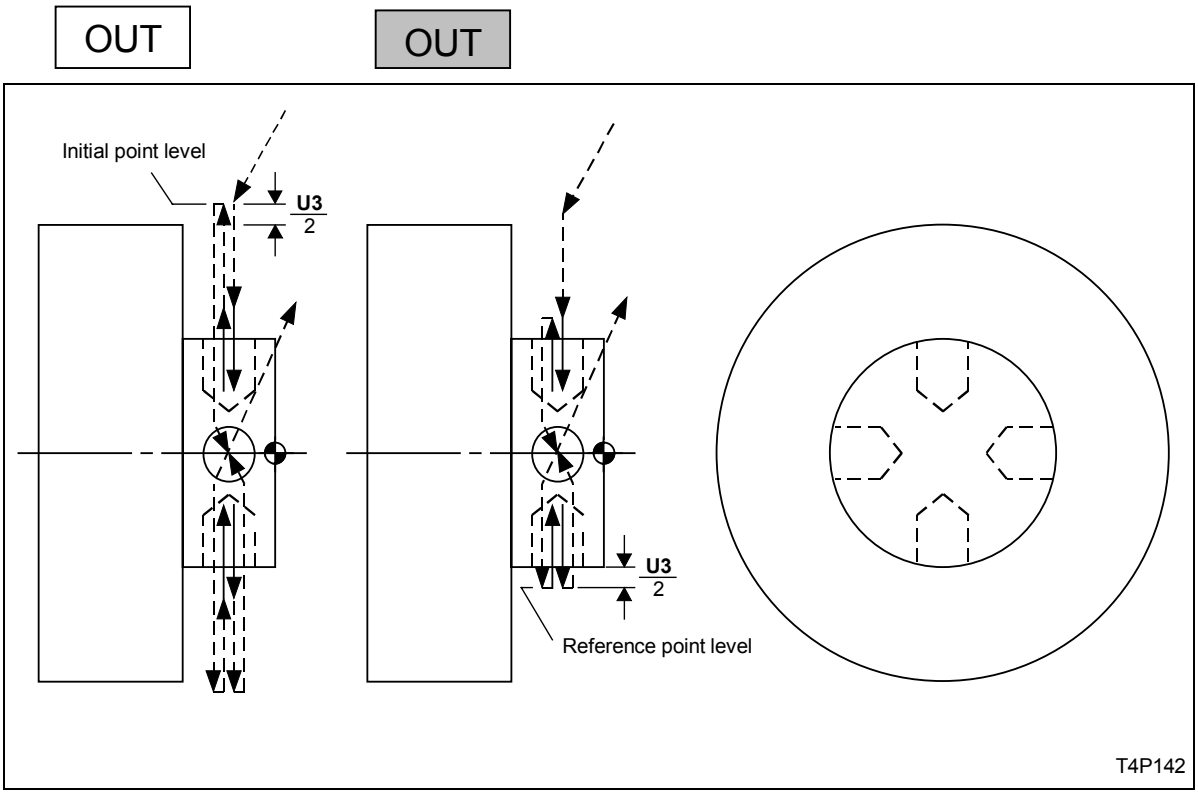


When creating a MDR/MTP process the menu options will ask you to select from the choices below (BAK, only on 2nd spindle machines).

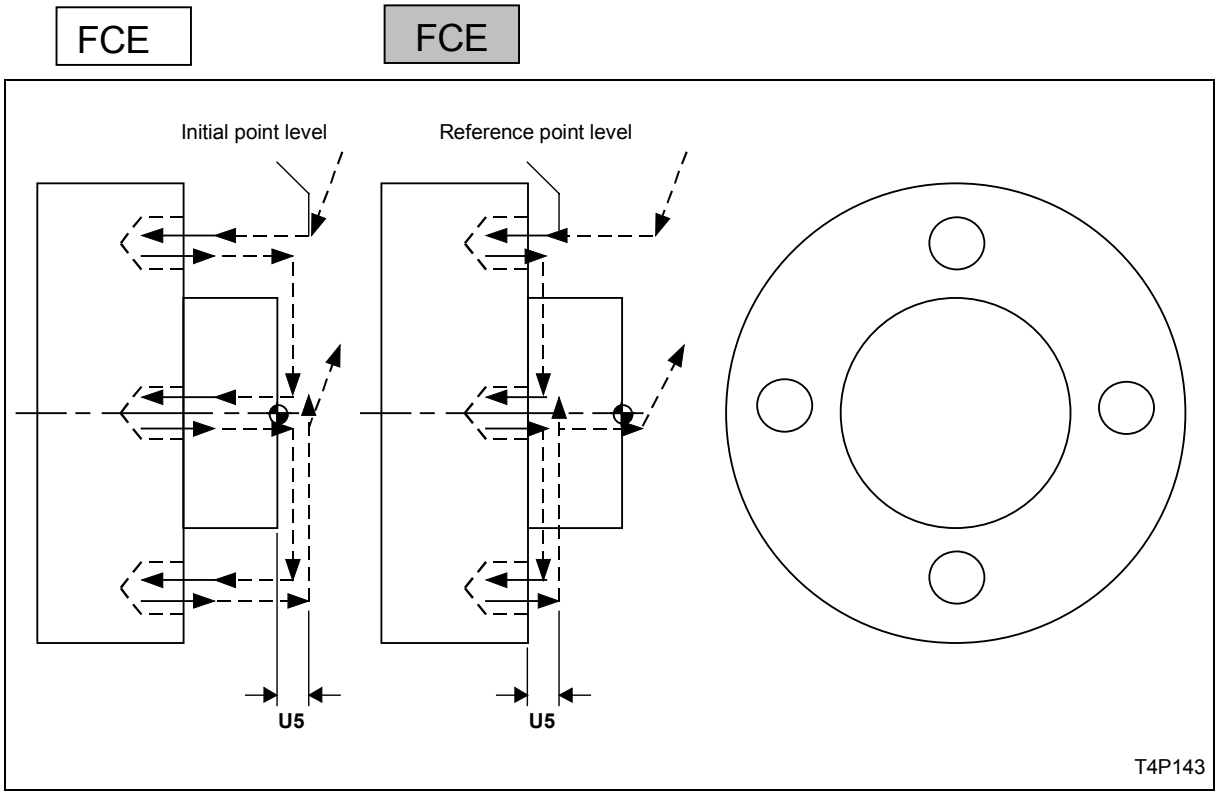
The choice between normal and highligthed options affect tool retraction between hole positions. See below:

OUT : Outer periphery (return to the initial point)
OUT : Outer periphery (return to the reference point)
FCE : Front face (return to the initial point)
FCE : Front face (return to the reference point)
BAK : Back face (return to the initial point)
BAK : Back face (return to the reference point)

MDR/MTP



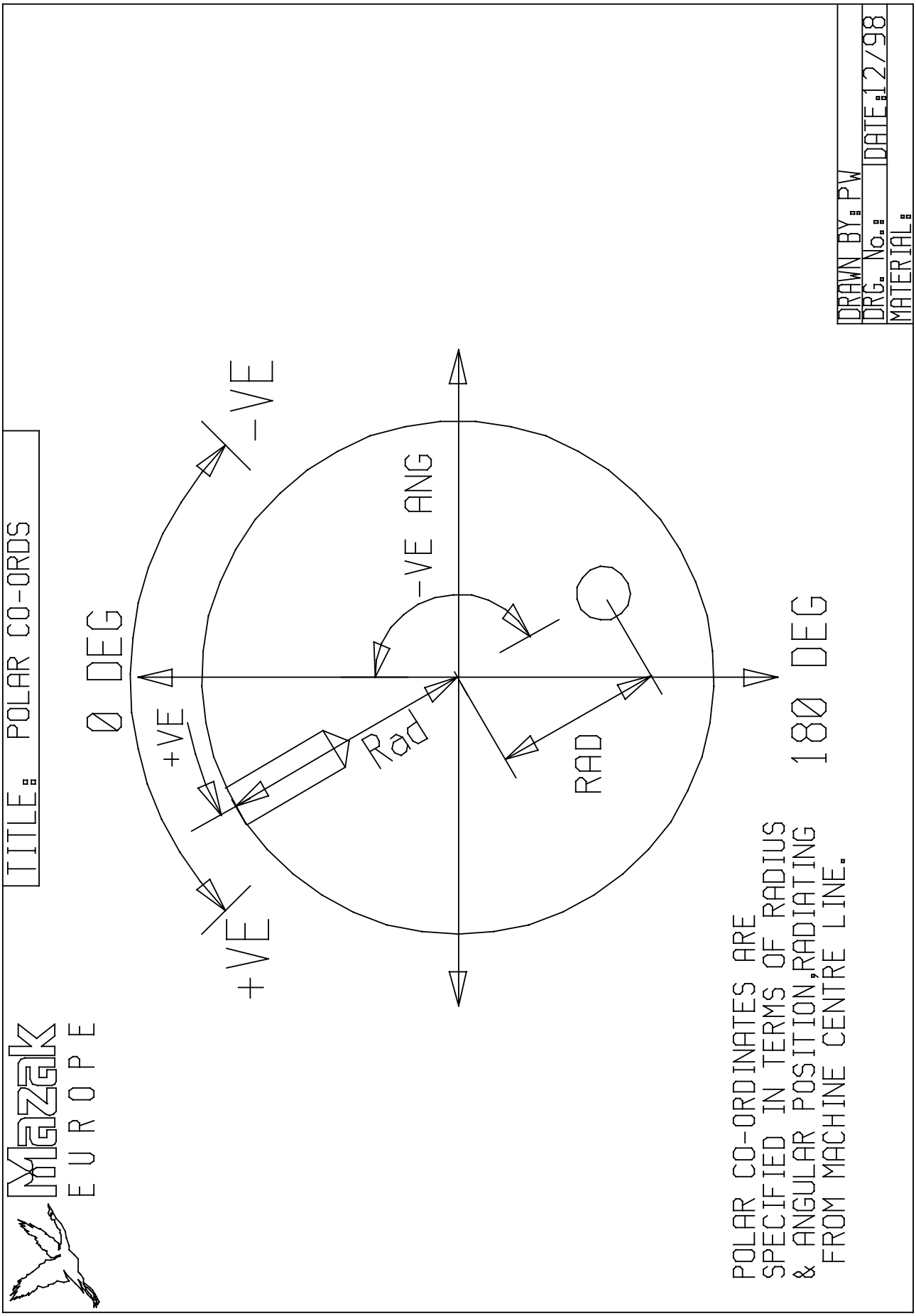
MDR/MTP



NOTE:

The differences in action will occur between ‘Return to the initial point’ and ‘Return to the reference point’, only if multiple holes are machined during one unit.
If ‘Return to the initial point’ is selected, the tip of the tool will return to the initial point (position that is away from the maximum-outside-diameter part or edge of the workpiece by the safety profile clearance amount) each time a hole is machined.
If ‘Return to the reference point’ is selected, the tip of the tool will return to the reference point (position at which the tool is away from the programmed starting point by the safety profile clearance amount) after machining of the first hole, and then start machining the next hole.
Before selecting ‘Return to the reference point’, check that during movement to the following hole positions, the tool tip will not interfere with any protruding sections of the workpiece or with any other

POLAR CO-ORDINATE SYSTEM


TITLE: POLAR CO-ORDS
DRAWN BY: PW
DRG. No.:
DATE:12/98
MATERIAL:
Mazak
EUROPE
Ø DEG
180 DEG
-VE
+VE
+VE
-VE ANG
Rad
RAD
POLAR CO-ORDINATES ARE
SPECIFIED IN TERMS OF RADIUS
& ANGULAR POSITION,RADIATING
FROM MACHINE CENTRE LINE.

Setting sequence data

UNo.	UNIT	#	DIA	DEPTH	DEP-1	DEP-2	DEP-3	C-SD	FEED	TOOL
*	MDR ***	*	***	***	***	***	***	***	***	***
SEQ	SHP	SPT-R/x	SPT-TH/y	SPT-Z		NUM.	ANGLE	TYPE		
1	①	②	③	④		⑤	⑥	⑦		

①SHP

The following menu will be displayed when the cursor is placed at this item.

POINT		CIRCLE						SHAPE END	

(a) (b)

Select (a) or (b) from the menu above.
The data of the displayed menu represent hole-drilling position patterns.

- Select **POINT** if one hole is to be drilled at any position.
- Select **CIRCLE** to drill multiple holes at an equal pitch along the same circumference with its center set at the program origin.

② SPT-R/x, ③ SPT-TH/y ④ SPT-Z

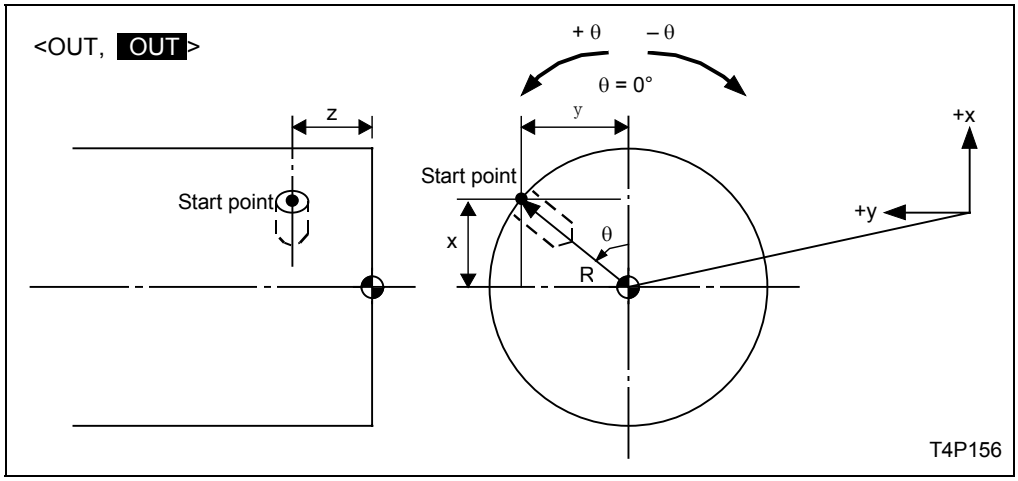
Specify a drilling start position for the hole you are going to make.
Set either the R-θ coordinates or x-y coordinates of the starting point in items ② and ③.

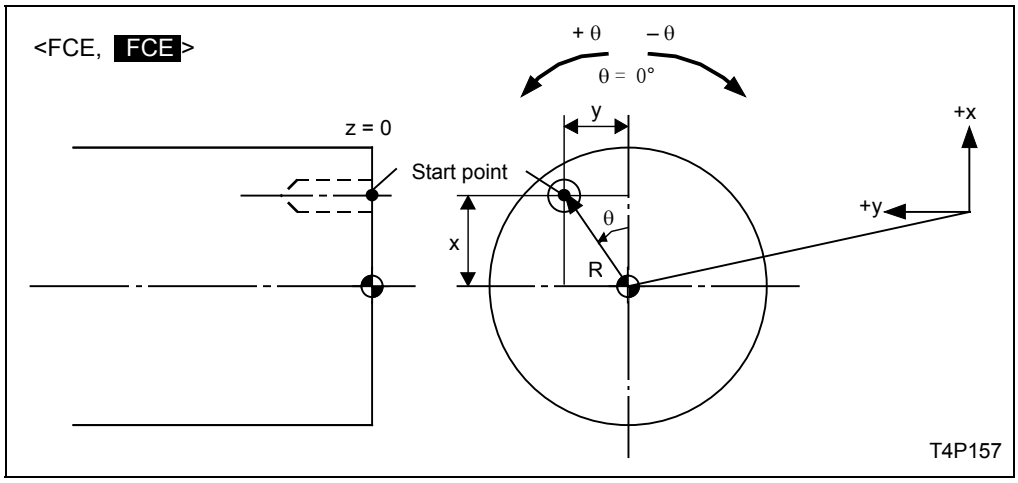
- To use the R-θ coordinates, set the radius and the angle as they are.
- To use the x-y coordinates, set data after reversing **x-y INPUT** display by pressing its menu key.

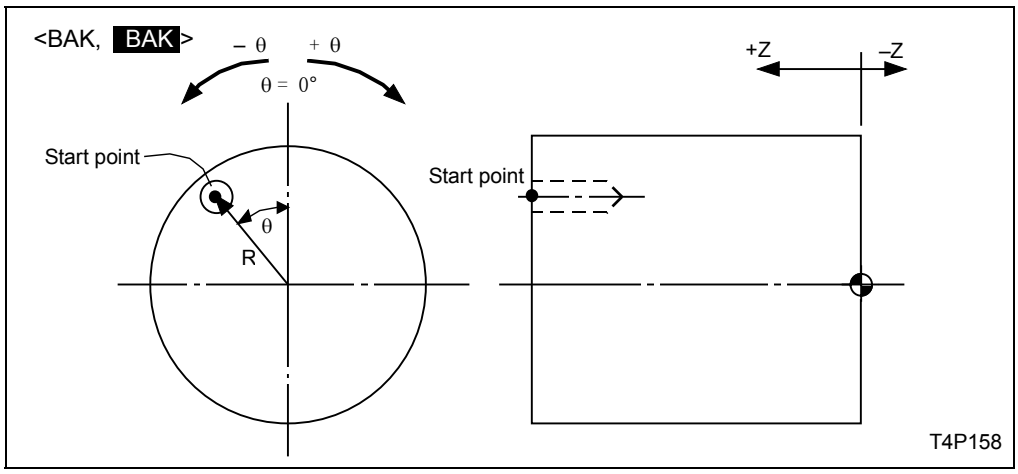
  Set the Z-coordinate of the starting point in data filed ④.

Note 1: For **BAK** and BAK only R-θ coordinates can be entered (a restriction because of the 1-degree orientation function of the No. 2 spindle).

Note 2: The manner of assigning a sign for θ is opposite between BAK and OUT or FCE.

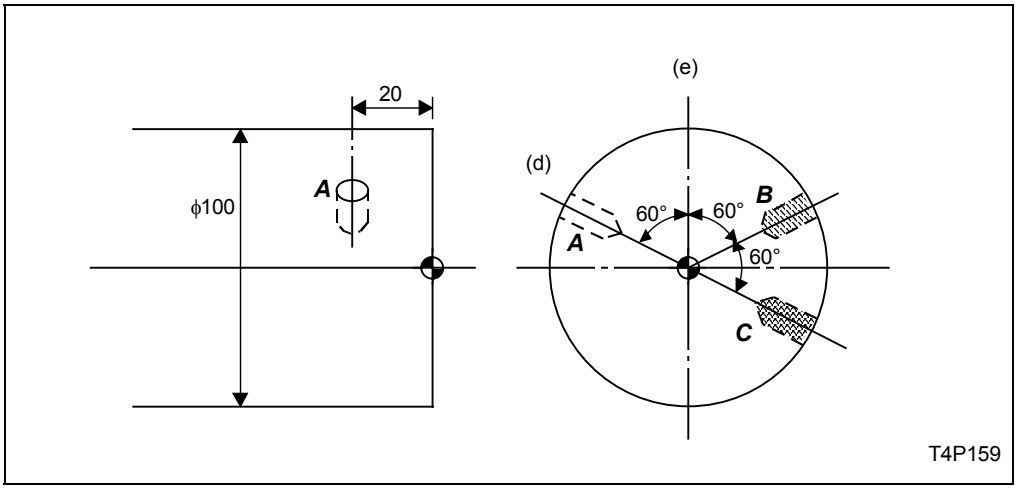






Note 3: The C-axis program origin position (θ = 0º) can be taken at any point convenient for programming.

Example: To drill holes ***A***, ***B*** and ***C*** at the positions shown below.



1) Set the following data if you have taken the position of (d) as θ = 0°:

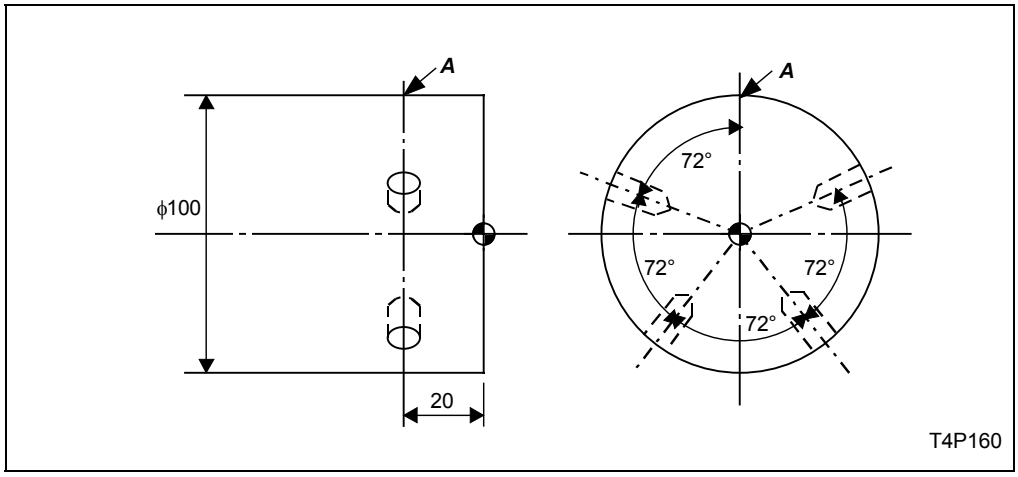
	UNo.	UNIT	#	DIA	DEPTH	DEP-1
	*	MDR OUT	*	***	***	***
	SEQ	SHP	SPT-R/x	SPT-TH/y	SPT-Z	
Hole ***A*** →	1	PNT	50.	0.	20.	
Hole ***B*** →	2	PNT	50.	-120.	20.	
Hole ***C*** →	3	PNT	50.	-180.	20.	

2) Set the following data if you have taken the position of (e) as θ = 0°:

	UNo.	UNIT	#	DIA	DEPTH	DEP-1
	*	MDR OUT	*	***	***	***
	SEQ	SHP	SPT-R/x	SPT-TH/y	DEP-Z	
Hole ***A*** →	1	PNT	50.	60.	20.	
Hole ***B*** →	2	PNT	50.	-60.	20.	
Hole ***C*** →	3	PNT	50.	-120.	20.	

Note 4: If you have selected **CIRCLE** for data item ①, you can set the stating point at a position other than the actual drilling position.

Example: To drill holes at the positions shown below:



Point ***A*** can be set as the starting point.
In this case, however, 1 (No machining at the starting position) must be set in data field ⑦, **TYPE**, described below.

UNo.	UNIT	#	DIA	DEPTH	DEP-1	DEP-2		
*	MDR OUT	*	***	***	***	***		
SEQ	SHP	SPT-R/x	SPT-TH/y	SPT-Z		NUM.	ANGLE	TYPE
1	CRC	50.	0.	20.		4.	72.	1

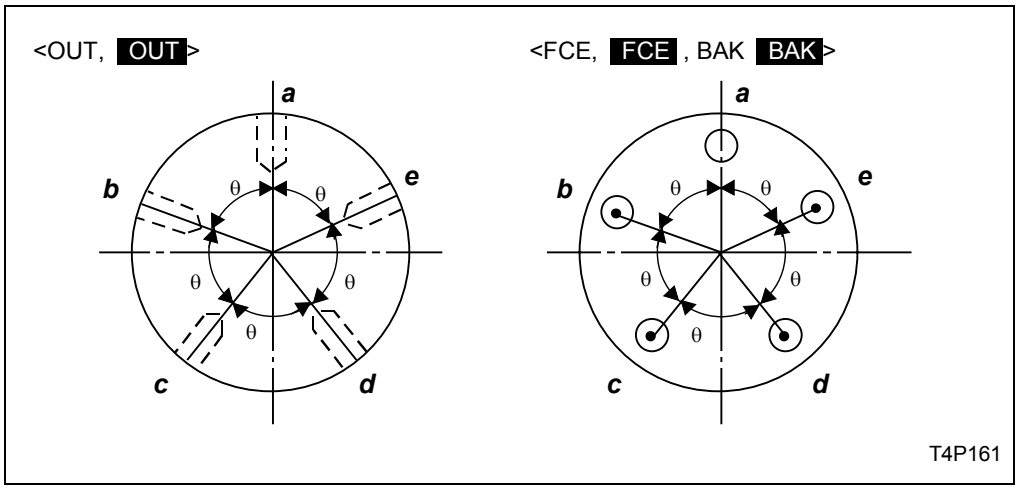
⑤ NUM.

- If **POINT** is selected for data item ①:
  A ◆ mark will be displayed in this position to indicate that no data can be set.
- If **CIRCLE** is selected for data item ①:
  Set the number of holes to be drilled.

⑥ ANGLE

- If **POINT** is selected for data item ①:
  A ◆ mark will be displayed in this position to indicate that no data can be set.

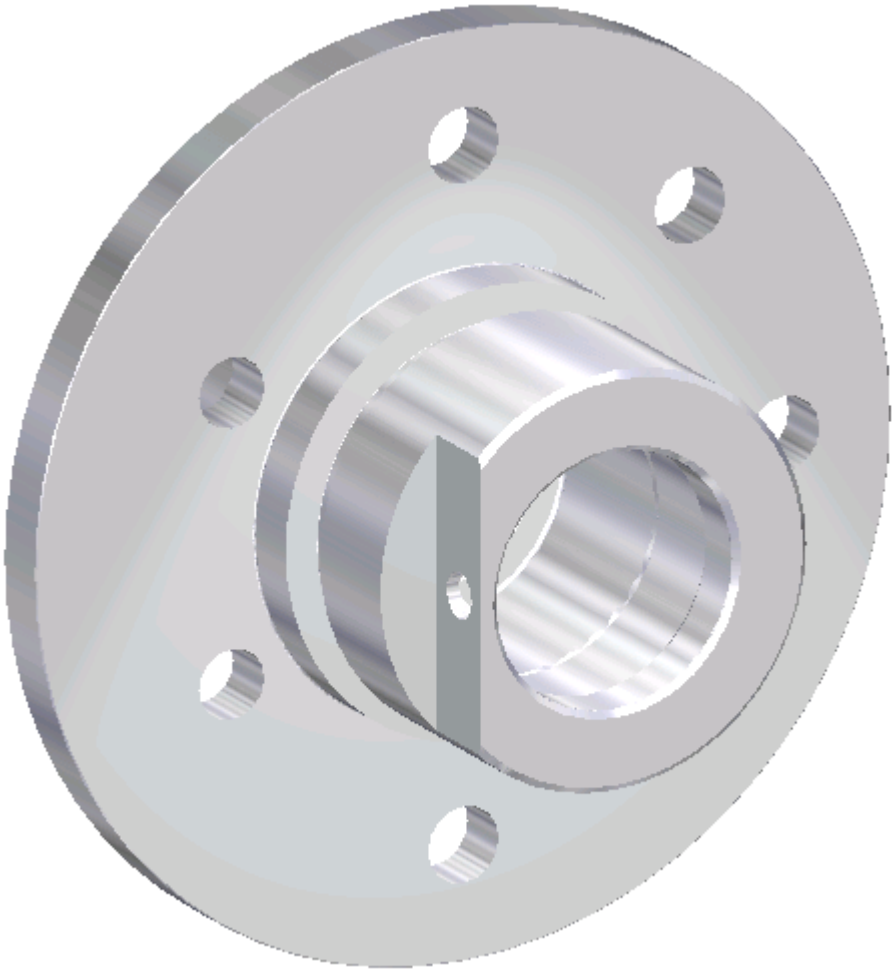
- If **CIRCLE** is selected for data item ①:
  Set a drilling pitch angle (θ in the diagram below) for the holes you are going to make.
  If θ **>** 0, the machining order is ***a*** → ***b*** → ***c*** → ***d*** → ***e***.
  If θ **<** 0, the machining order is ***a*** → ***e*** → ***d*** → ***c*** → ***b***.

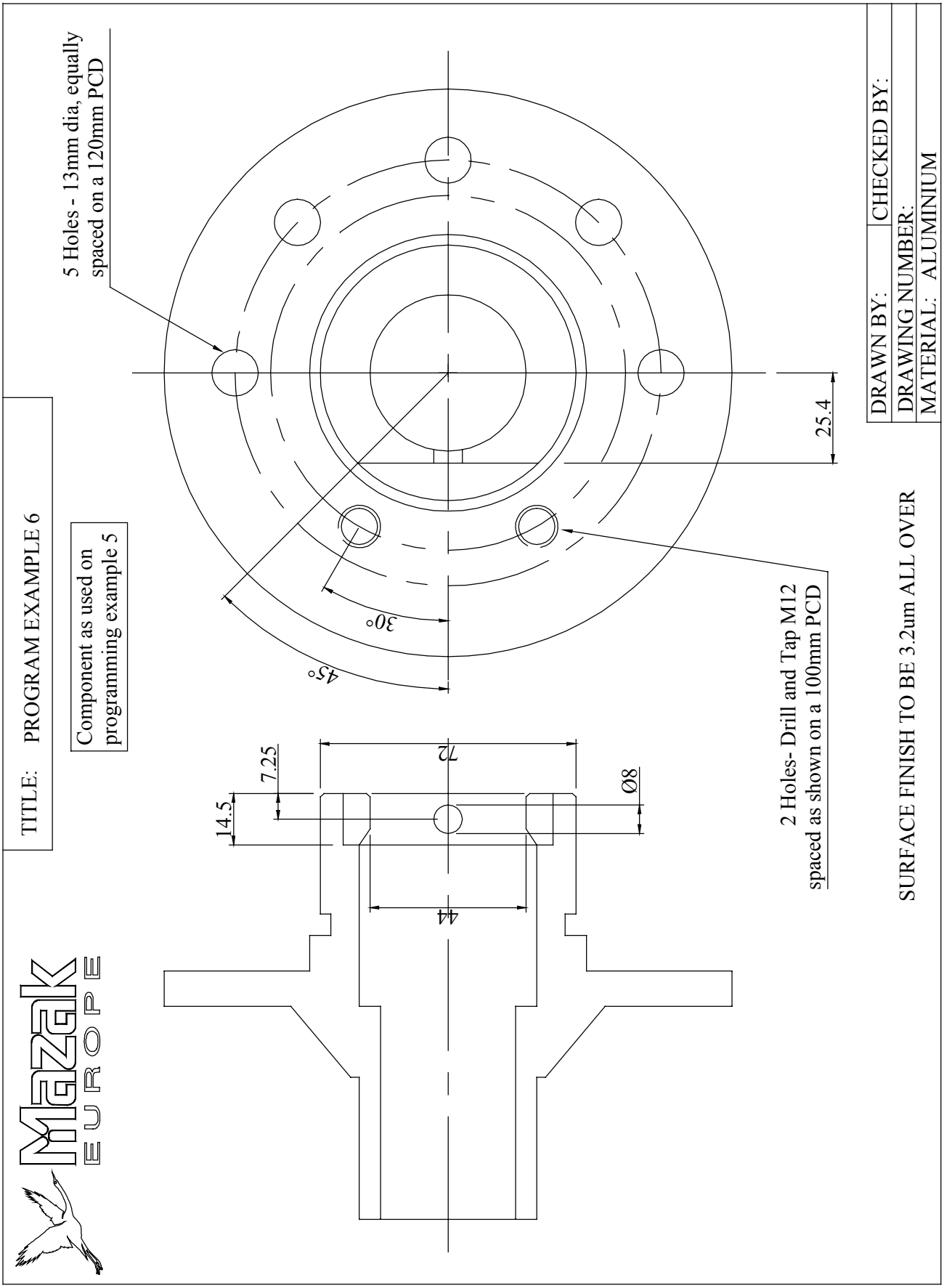


⑦ TYPE

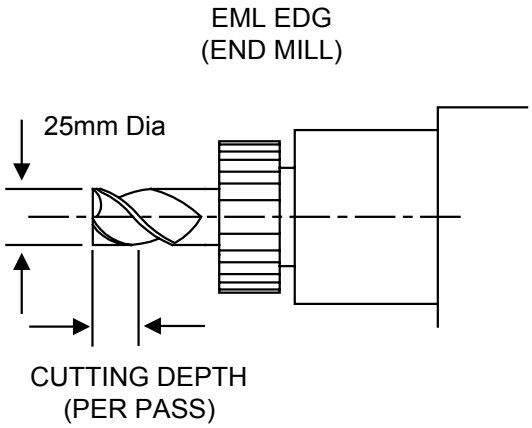
- If **POINT** is selected for data item ①:
  A ◆ mark will be displayed in this position to indicate that no data can be set.
- If **CIRCLE** is selected for data item ①:
  Specify whether the hole is to be drilled at the starting position whose data has been specified in data items ② to ④.
  Set 0 if drilling is to be done.
  Set 1 if drilling is not to be done.

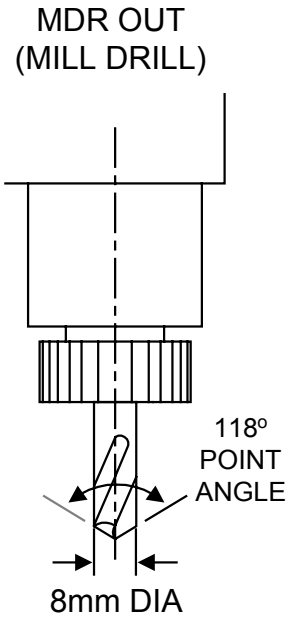
PROGRAMMING
EXAMPLE NO.6

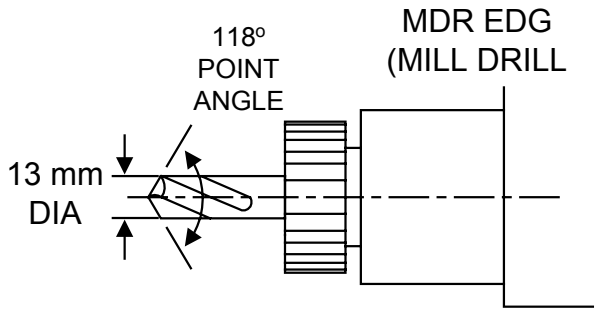


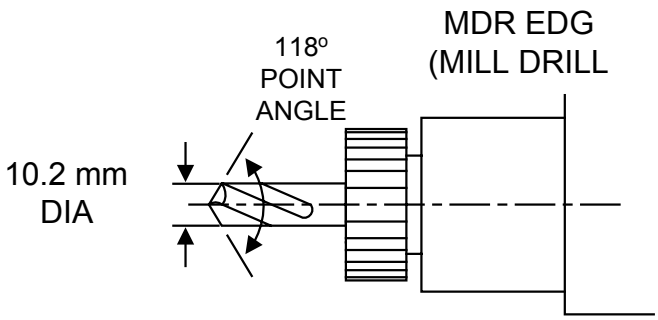

TITLE: PROGRAM EXAMPLE 6
Component as used on programming example 5
5 Holes - 13mm dia, equally spaced on a 120mm PCD
2 Holes- Drill and Tap M12 spaced as shown on a 100mm PCD
SURFACE FINISH TO BE 3.2um ALL OVER
DRAWN BY:
CHECKED BY:
DRAWING NUMBER:
MATERIAL: ALUMINIUM
25.4
30°
45°
72
44
14.5
7.25
Ø8
MAZAK EUROPE

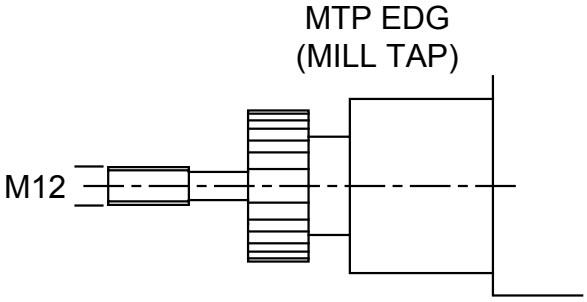
MILLING TOOLS FOR PROGRAM EXAMPLE No 6







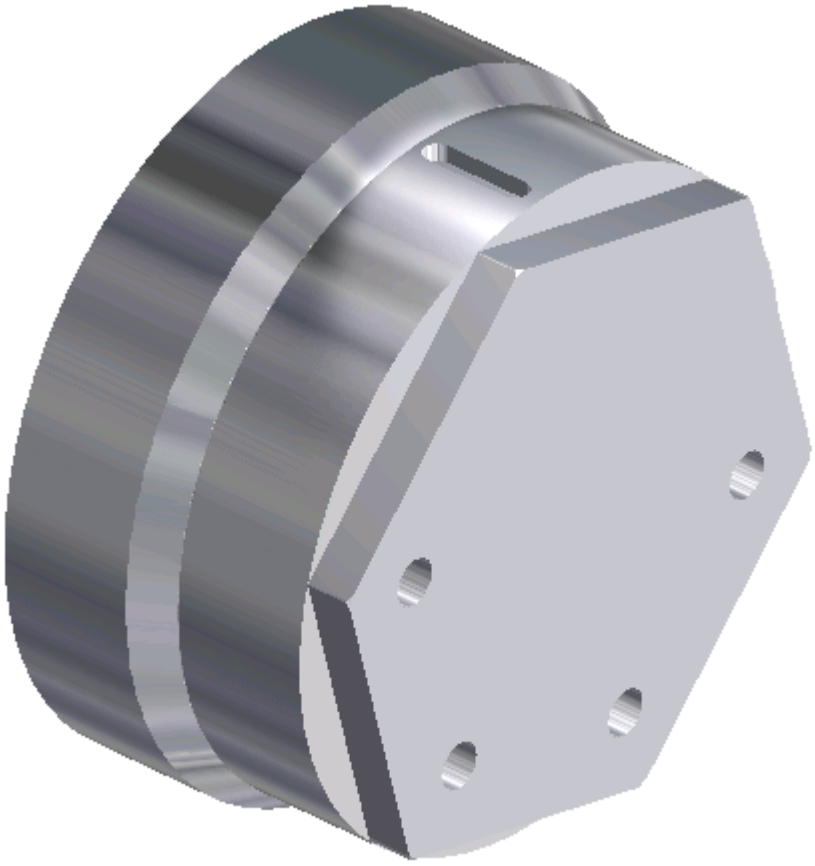


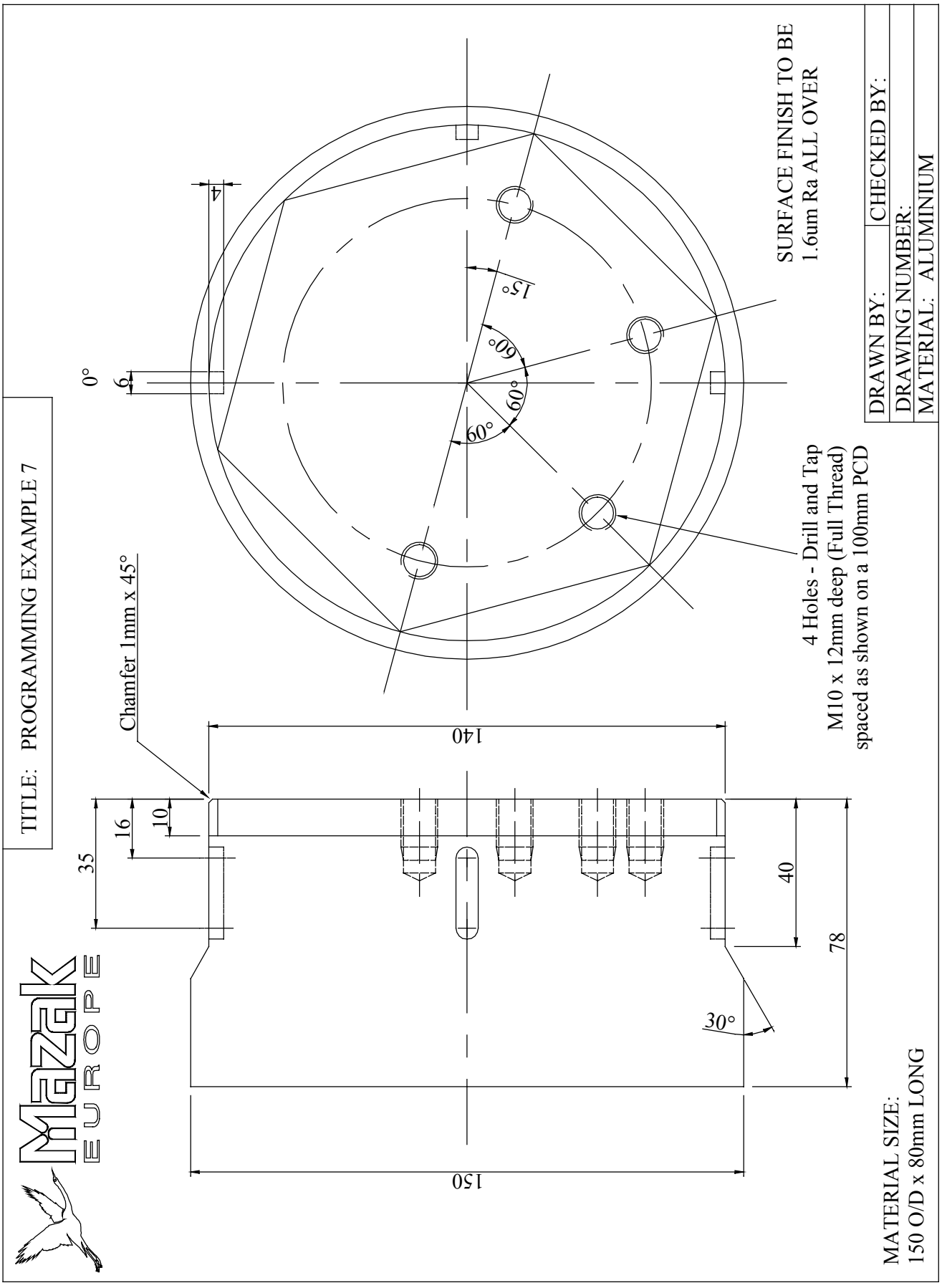


```
UNo. MAT    OD-MAX   ID-MIN   LENGTH    RPM    FIN-X   FIN-Z   WORK FACE
  0 AL       160.      38.     120.     3000    0.4     0.1         0.

UNo. MODE
  1MTR OUT
SEQ SHP           SPT-X      SPT-Z      FPT-X      FPT-Z              RADIUS
  1LIN              *          *         83.        48.                 *
  2LIN              *          *        160.        80.                 *
  3LIN              *          *         50.       120.                 *

UNo. MODE  # 1  # 2  # 3  # 4    # 5  # 6  # 7  # 8    # 9  #10  #11  #12
  2M         8

UNo. MODE  #  CPT-X  CPT-Z             RV    FV  R-FEED R-DEP.  R-TOOL F-TOOL
  3BAR FCE 0   160.    48.              375   700  0.4     1.         3
SEQ SHP S-CNR    SPT-X      SPT-Z      FPT-X      FPT-Z    F-CNR/$ RADIUS/ø   ROUGH
  1LIN              *          *         83.        50.                 *

UNo. MODE  #  CPT-X  CPT-Z             RV    FV  R-FEED R-DEP.  R-TOOL F-TOOL
  4BAR OUT 0    83.      0.             375   700  0.4     5.5        3
SEQ SHP S-CNR    SPT-X      SPT-Z      FPT-X      FPT-Z    F-CNR/$ RADIUS/ø   ROUGH
  1LIN C 1.         *          *         72.        40.                 *
  2LIN              *          *         78.        50.                 *

UNo. MODE  #  CPT-X  CPT-Z             RV    FV  R-FEED R-DEP.  R-TOOL F-TOOL
  5BAR OUT 0   160.      0.             375   700  0.4     5.5                2
SEQ SHP S-CNR    SPT-X      SPT-Z      FPT-X      FPT-Z    F-CNR/$ RADIUS/ø   ROUGH
  1LIN C 1.         *          *         72.        40.                 *      Rgh 4
  2LIN              *          *         78.        50.                 *      Rgh 4
  3LIN C 0.5        *          *        160.        50.5                *      Rgh 4

UNo. MODE  #  CPT-X  CPT-Z             RV    FV  R-FEED R-DEP.  R-TOOL F-TOOL
+ 6BAR BAK 0   160.    80.              375   700  0.35    3.         4A     4A
SEQ SHP S-CNR    SPT-X      SPT-Z      FPT-X      FPT-Z    F-CNR/$ RADIUS/ø   ROUGH
  1LIN              *          *       88.564      60.                 *      Rgh 4
  2TPR           88.564     60.        55.        80.                50.     Rgh 4

UNo. MODE  # No. PITCH  WIDTH FINISH    RV    FV   FEED   DEP.   R-TOOL F-TOOL
  7GRV OUT 1  1          6.     0.      120   139  0.1    2.         8      8
SEQ      S-CNR    SPT-X      SPT-Z      FPT-X      FPT-Z    F-CNR     ANGLE   ROUGH
  1                72.        34.        66.        34.                        Rgh 4

UNo. MODE  #  CPT-X  CPT-Z             RV    FV  R-FEED R-DEP.  R-TOOL F-TOOL
  8BAR IN  0    38.      0.             375   700  0.4     5.         6      7
SEQ SHP S-CNR    SPT-X      SPT-Z      FPT-X      FPT-Z    F-CNR/$ RADIUS/ø   ROUGH
  1LIN C 1.5        *          *         44.        10.                 *      Rgh 4
  2TPR           44.        10.        50.        14.5               -33.69   Rgh 4
  3LIN              *          *         50.        60.                 *      Rgh 4
  4LIN C 0.5        *          *         38.        60.5                *      Rgh 4

UNo. MODE GRV-WID DEPTH  FIN-1 FIN-2   RV    FV  R-FR 1 R-FR 2  R-TOOL F-TOOL
  9LFT FCE 25.    14.5   0.    0.      150   300  0.15    0.25   10A    10A
SEQ SHP   FPT-R/x   FPT-An/y    FPT-Z                    F-CNR     RADIUS   ROUGH
  1STP      36.      135.         0.                                *      Rgh 4
  2LIN      36.       45.          *                                *      Rgh 4

UNo. MODE  #  DIA.     DEPTH    DEP-1  DEP-2   DEP-3     V    FEED          TOOL
 10MDR OUT 2   8.      15.       8.     3.      3.       25  0.032          10C
SEQ SHP  SPT-R/x  SPT-An/y SPT-Z                                NUM. ANGLE TYPE
  1PNT   25.4      90.        7.25                                 *     *    *
```

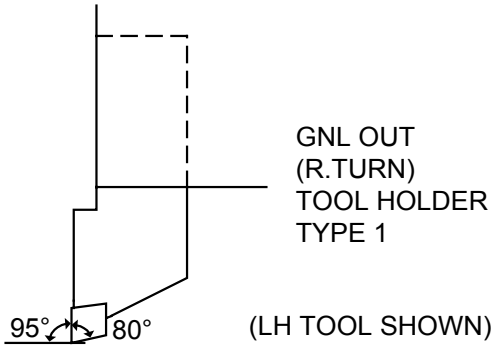
```
UNo. MODE  #  DIA.     DEPTH   DEP-1  DEP-2   DEP-3    V    FEED          TOOL
 11MDR FCE 2  13.      15.     13.     3.      3.       25  0.200          11A
SEQ SHP  SPT-R/x  SPT-An/y SPT-Z                              NUM. ANGLE TYPE
  1CIR   60.       0.      50.                                  5  -45.    0

UNo. MODE  #  DIA.     DEPTH   DEP-1  DEP-2   DEP-3    V    FEED          TOOL
 12MDR FCE 2  10.2     15.     10.2    3.      3.       25  0.200          10D
SEQ SHP  SPT-R/x  SPT-An/y SPT-Z                              NUM. ANGLE TYPE
  1PNT   50.       60.     50.                                  *     *    *
  2PNT   50.      120.     50.                                  *     *    *

UNo. MODE     NOM-DIA     PITCH       DEPTH   DWELL   V                  TOOL
 13MTP FCE    M12.         1.75        15.      0.       8                  9C
SEQ SHP  SPT-R/x  SPT-An/y SPT-Z                              NUM. ANGLE TYPE
  1CIR   50.       60.     50.                                  2   60.    0

UNo. MODE  COUNTER   RETURN  WK.No.  CONT.   NUM.     SHIFT
 14END        0        0               0       0       0.
```

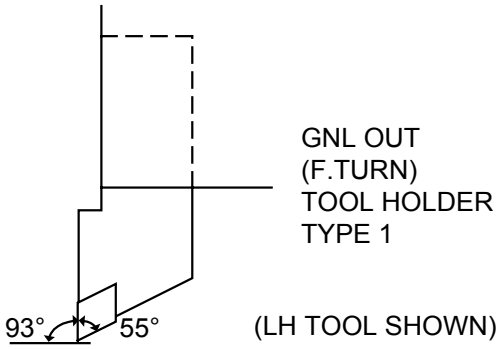
PROGRAMMING
EXAMPLE N0.7

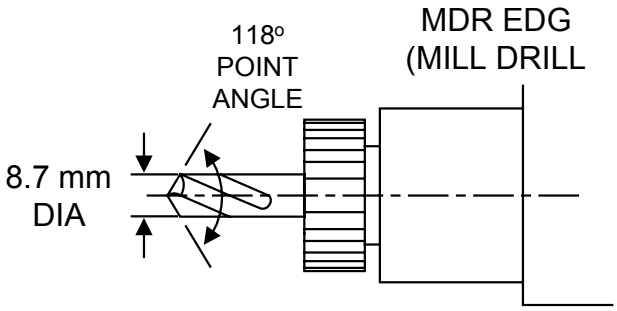


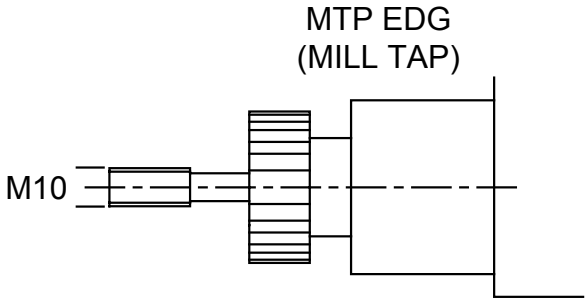

TITLE: PROGRAMMING EXAMPLE 7
SURFACE FINISH TO BE
1.6um Ra ALL OVER
DRAWN BY:
CHECKED BY:
DRAWING NUMBER:
MATERIAL: ALUMINIUM
4 Holes - Drill and Tap
M10 x 12mm deep (Full Thread)
spaced as shown on a 100mm PCD
Chamfer 1mm x 45°
MATERIAL SIZE:
150 O/D x 80mm LONG
Mazak
EUROPE
0°
15°
60°
60°
60°
4
9
140
150
35
16
10
40
78
30°

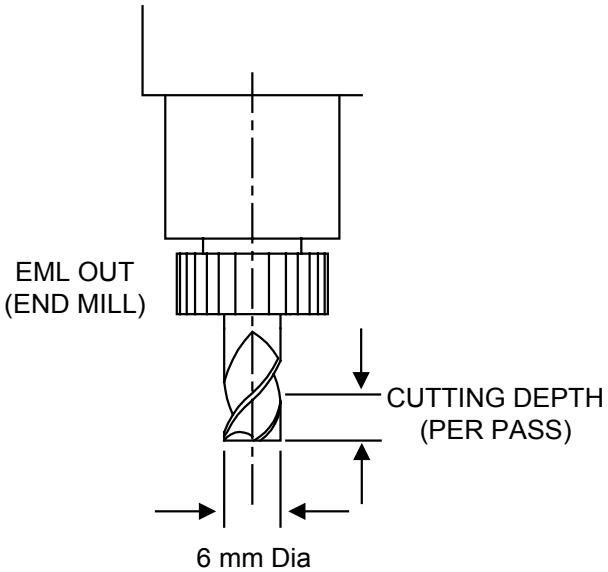
TOOLS FOR PROGRAM EXAMPLE No 7

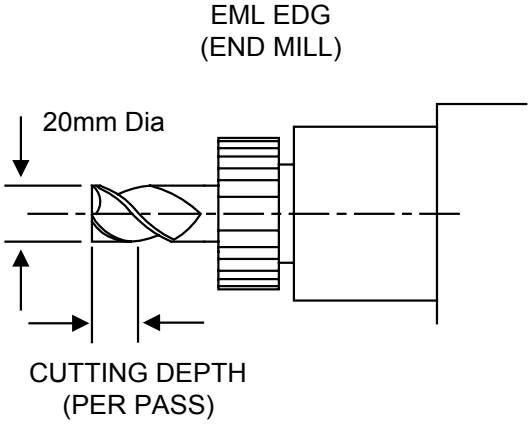






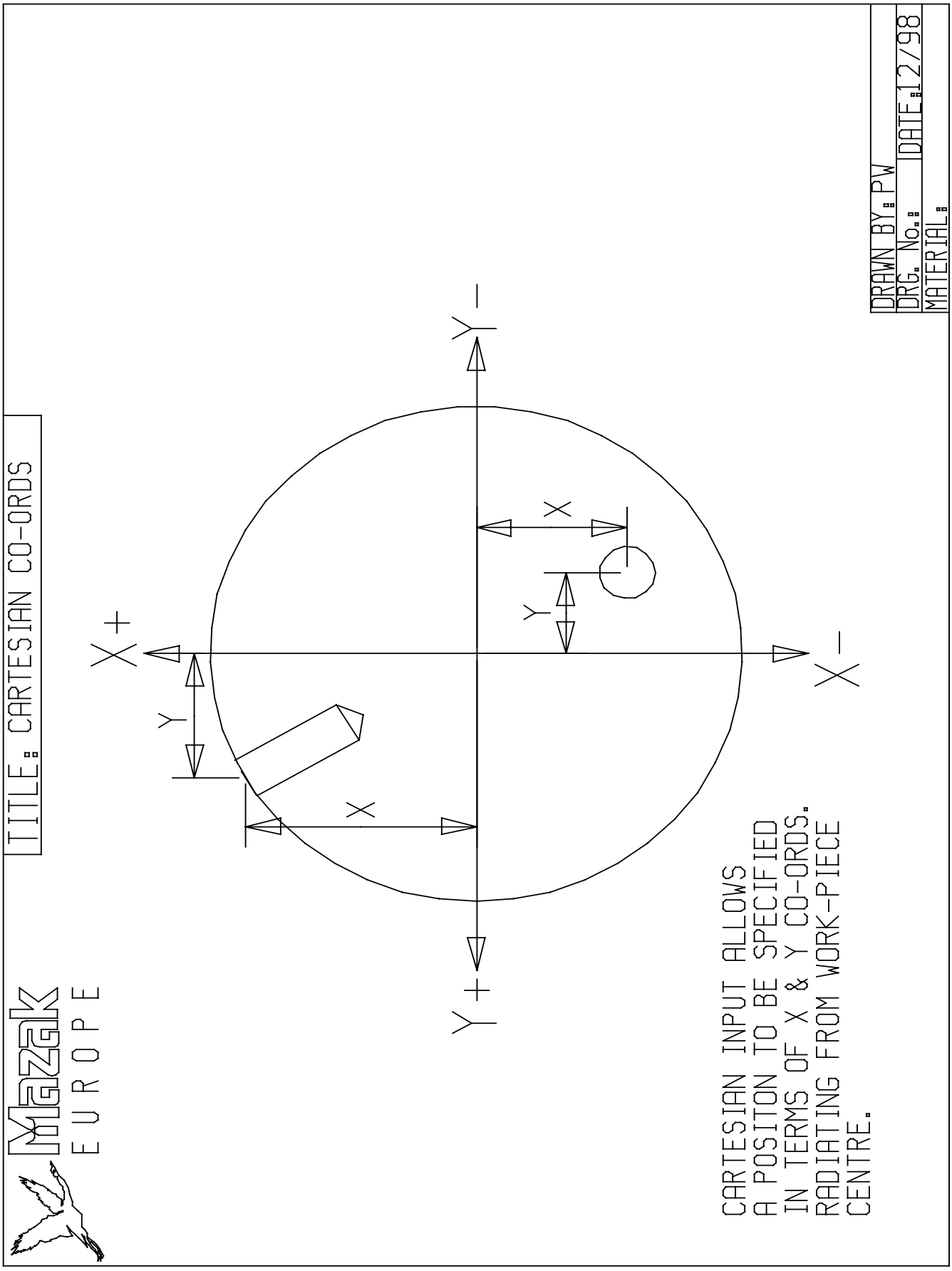






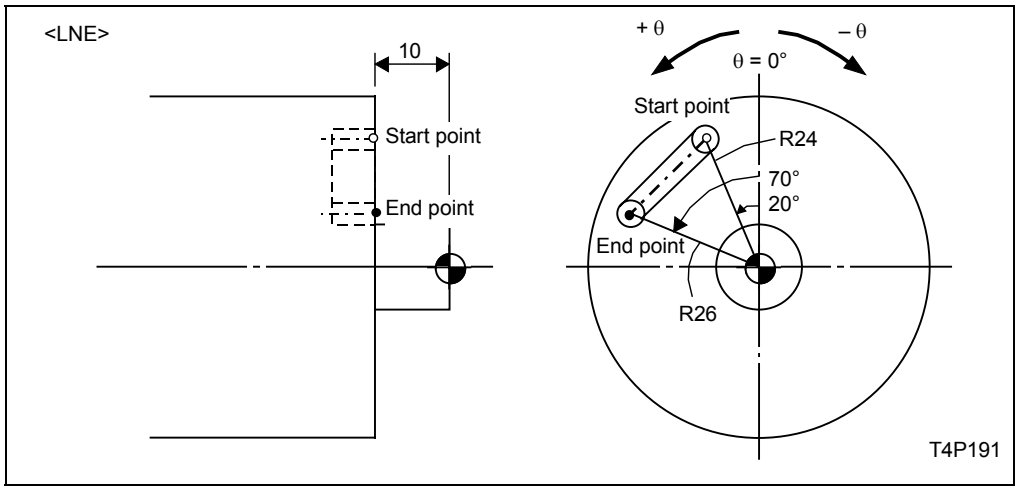
```
UNo. MAT    OD-MAX   ID-MIN   LENGTH    RPM    FIN-X   FIN-Z   WORK FACE
  0 AL       150.       0.      80.     3000    0.4     0.1         2.

UNo. MODE   # 1   # 2   # 3   # 4     # 5   # 6   # 7   # 8     # 9   #10   #11   #12
  1M          8


UNo. MODE                                 RV     FV   R-FEED R-DEP.   R-TOOL F-TOOL
  2EDG FCE                                375    700   0.35   3.         1      2
SEQ               SPT-X      SPT-Z      FPT-X      FPT-Z                        ROUGH
  1               150.         2.         0.         0.                          Rgh 5


UNo. MODE   #  CPT-X  CPT-Z               RV     FV   R-FEED R-DEP.   R-TOOL F-TOOL
  3BAR OUT 0    150.     0.               375    700   0.4    5.5      1      2
SEQ SHP S-CNR     SPT-X      SPT-Z      FPT-X      FPT-Z    F-CNR/$ RADIUS/ø    ROUGH
  1LIN C 1.          *          *       140.        40.                 *       Rgh 5
  2TPR             140.        40.      150.        48.66             30.       Rgh 5


UNo. MODE   #  DIA.     DEPTH    DEP-1   DEP-2    DEP-3     V     FEED          TOOL
  4MDR FCE 1    8.7     20.       8.7     3.       3.        62   0.034          11A
SEQ SHP   SPT-R/x   SPT-An/y SPT-Z     SPT-Y/C CTR1/PITCH CTR2    NUM. ANGLE TYPE
  1CIR    50.        75.        0.          *          *         *      4    60.     0


UNo. MODE      NOM-DIA      PITCH        DEPTH    DWELL    V                   TOOL
  5MTP FCE     M10.          1.5          12.       0.        20                 11A
SEQ SHP   SPT-R/x   SPT-An/y SPT-Z     SPT-Y/C CTR1/PITCH CTR2    NUM. ANGLE TYPE
  1CIR    50.      -105.        0.          *          *         *      4   -60.     0


UNo. MODE   #    GRV-WID DEPTH   FINISH    RV     FV   R-FR 1 R-FR 2   R-TOOL F-TOOL
  6MGV OUT 1      6.       4.     0.1       76     76   0.04   0.02    12A    12A
SEQ         SPT-R       SPT-An      SPT-Z SPT-Y            FPT-R       FPT-Z     ROUGH
  1          70.          0.          16.        0.             *          35.       Rgh 5
  2          70.        -90.          16.        0.             *          35.       Rgh 5
  3          70.       -180.          16.        0.             *          35.       Rgh 5


UNo. MODE GRV-WID DEPTH   FIN-1 FIN-2    RV     FV   R-FR 1 R-FR 2   R-TOOL F-TOOL
  7LFT FCE 20.     10.     0.1   0.1       83    101   0.1    0.05     9A     9A
SEQ SHP    FPT-R/x    FPT-An/y     FPT-Z       FPT-Y/C      F-CNR      RADIUS    ROUGH
  1STP       70.      -105.         0.            *                        *       Rgh 5
  2LIN       70.      -165.          *            *                        *       Rgh 5
  3LIN       70.      -225.          *            *                        *       Rgh 5
  4LIN       70.      -285.          *            *                        *       Rgh 5
  5LIN       70.      -345.          *            *                        *       Rgh 5
  6LIN       70.       -45.          *            *                        *       Rgh 5
  7LIN       70.      -105.          *            *                        *       Rgh 5

UNo. MODE   COUNTER    RETURN   WK.No.   CONT.    NUM.      SHIFT
  8END         0         0                 0         0        0.
```

CARTESIAN CO-ORDINATE SYSTEM


TITLE: CARTESIAN CO-ORDS
DRAWN BY: PW
DRG. No.:
DATE: 12/98
MATERIAL:
Mazak
EUROPE
X+
X-
Y+
Y-
X
Y
X
Y
CARTESIAN INPUT ALLOWS
A POSITON TO BE SPECIFIED
IN TERMS OF X & Y CO-ORDS.
RADIATING FROM WORK-PIECE
CENTRE.

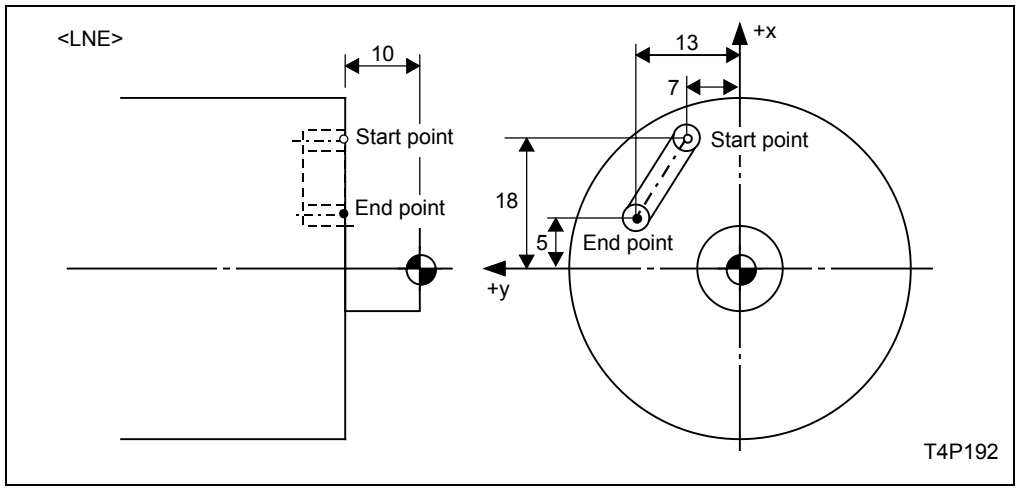
Examples using CARTESIAN co-ordinates in comparison to POLAR co-ordinates.

LINE



R-θ-Z-input

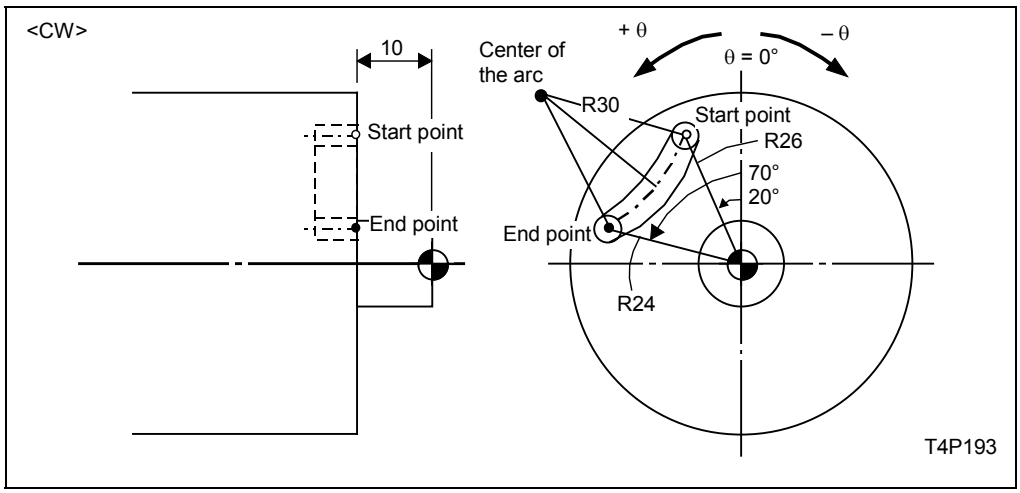
SEQ	SHP	FPT-R/x	FPT-TH/y	FPT-Z	CNR	RADIUS	RGH
1	STP	24.	20.	10.	◆	◆	
2	LNE	26.	70.	◆		◆	



x-y-Z-input

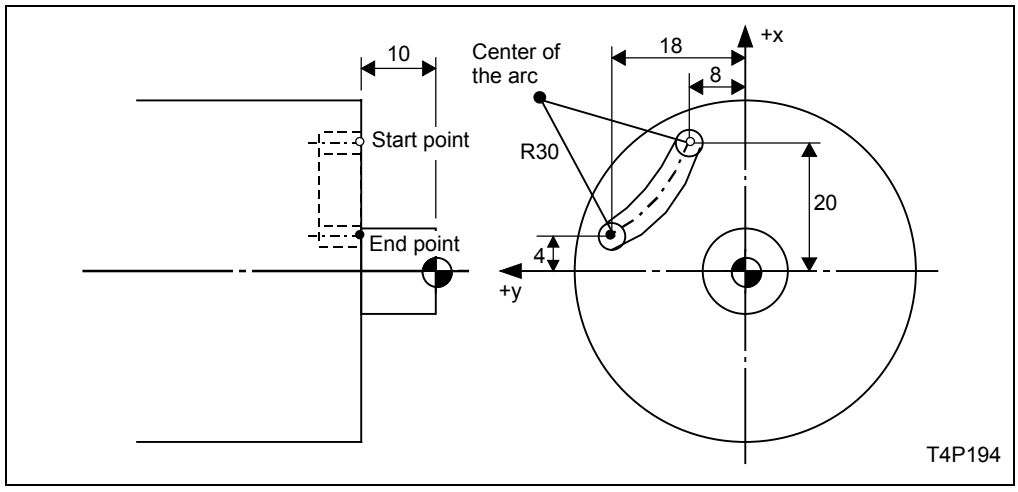
SEQ	SHP	FPT-R/x	FPT-TH/y	FPT-Z	CNR	RADIUS	RGH
1	STP	18.	7.	10.	◆	◆	
2	LNE	5.	13.	◆		◆	

CW ARC



R-θ-Z-input

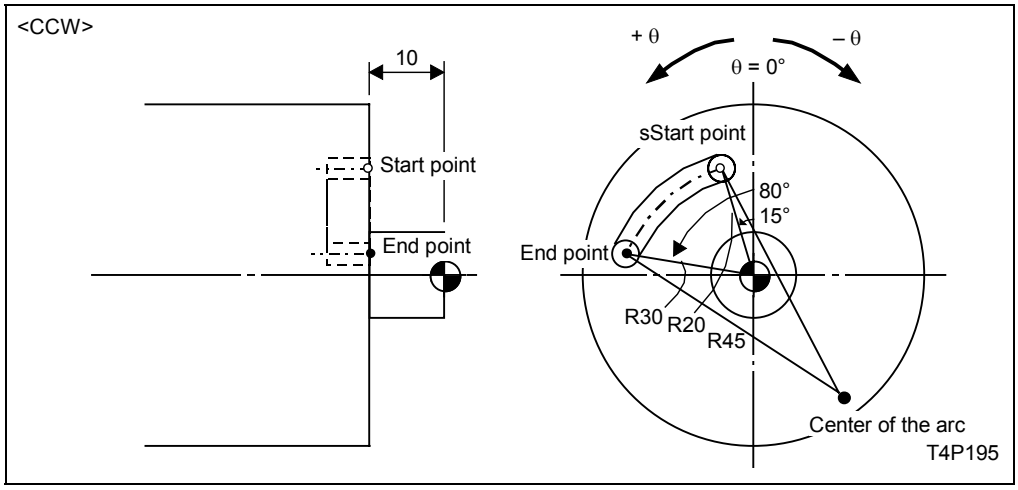
SEQ	SHP	FPT-R/x	FPT-TH/y	FPT-Z	CNR	RADIUS	RGH
1	STP	26.	20.	10.	◆	◆	
2	CW	24.	70.	◆		30.	



x-y-Z-input

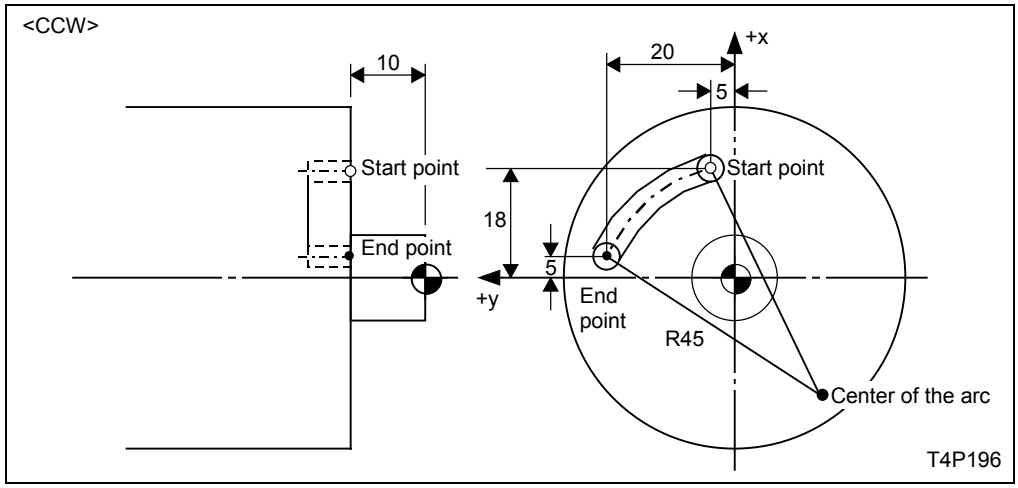
SEQ	SHP	FPT-R/x	FPT-TH/y	FPT-Z	CNR	RADIUS	RGH
1	STP	20.	8.	10.	◆	◆	
2	CW	4.	18.	◆		30.	

CCW ARC



R-θ-Z-input

SEQ	SHP	FPT-R/x	FPT-TH/y	FPT-Z	CNR	RADIUS	RGH
1	STP	20.	15.	10.	◆	◆	
2	CCW	30.	80.	◆		45.	

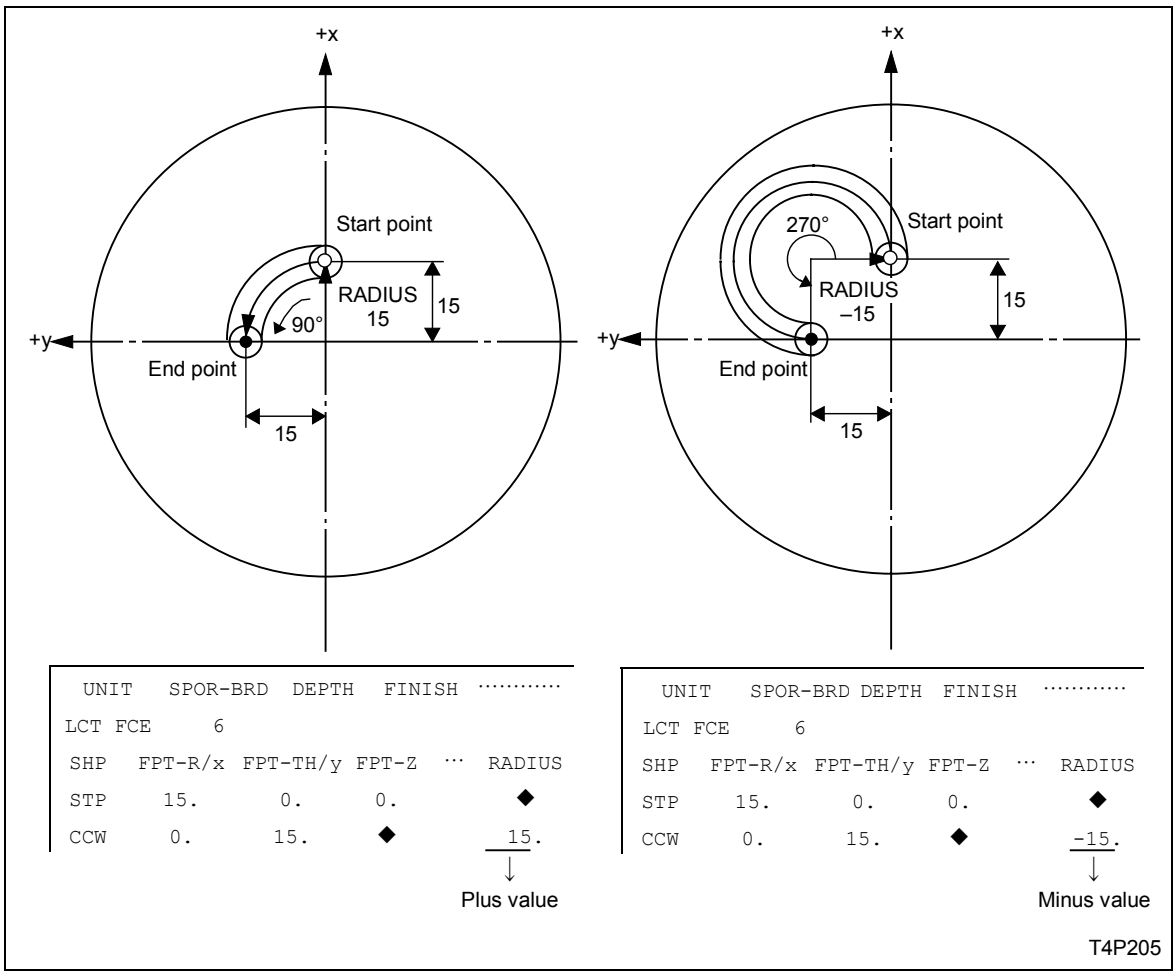


x-y-Z-input

SEQ	SHP	FPT-R/x	FPT-TH/y	FPT-Z	CNR	RADIUS	RGH
1	STP	18.	5.	10.	◆	◆	
2	CCW	5.	20.	◆		45.	

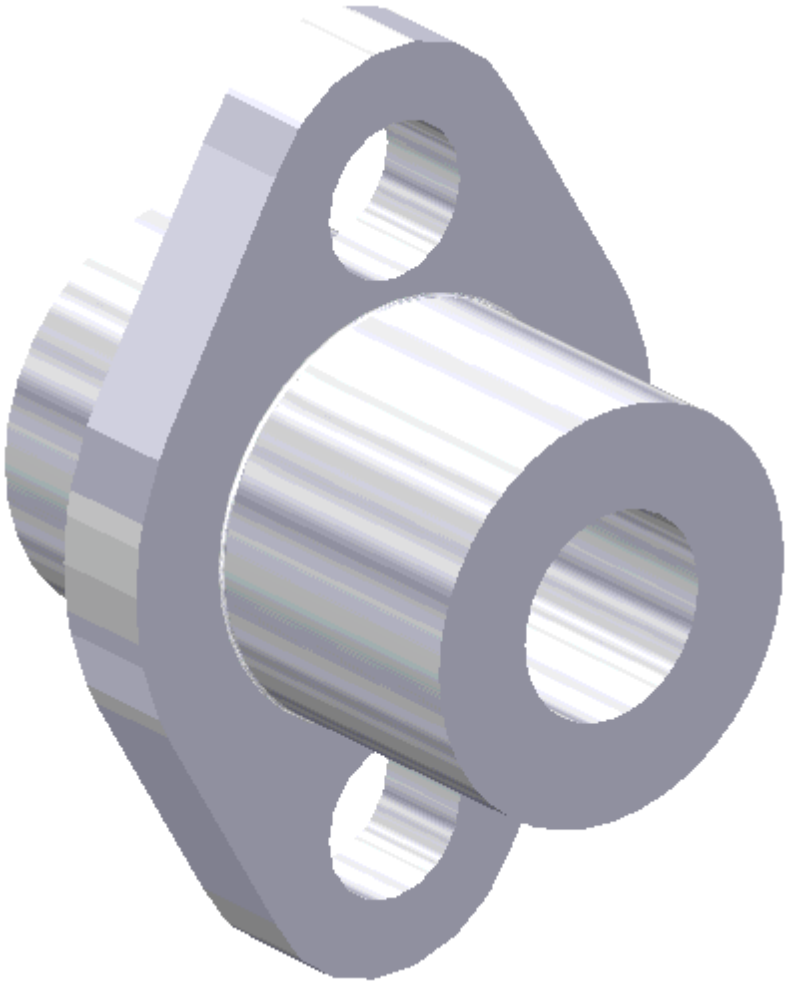
- Set data with a minus sign if the center angle of the arc is to exceed 180 degrees.

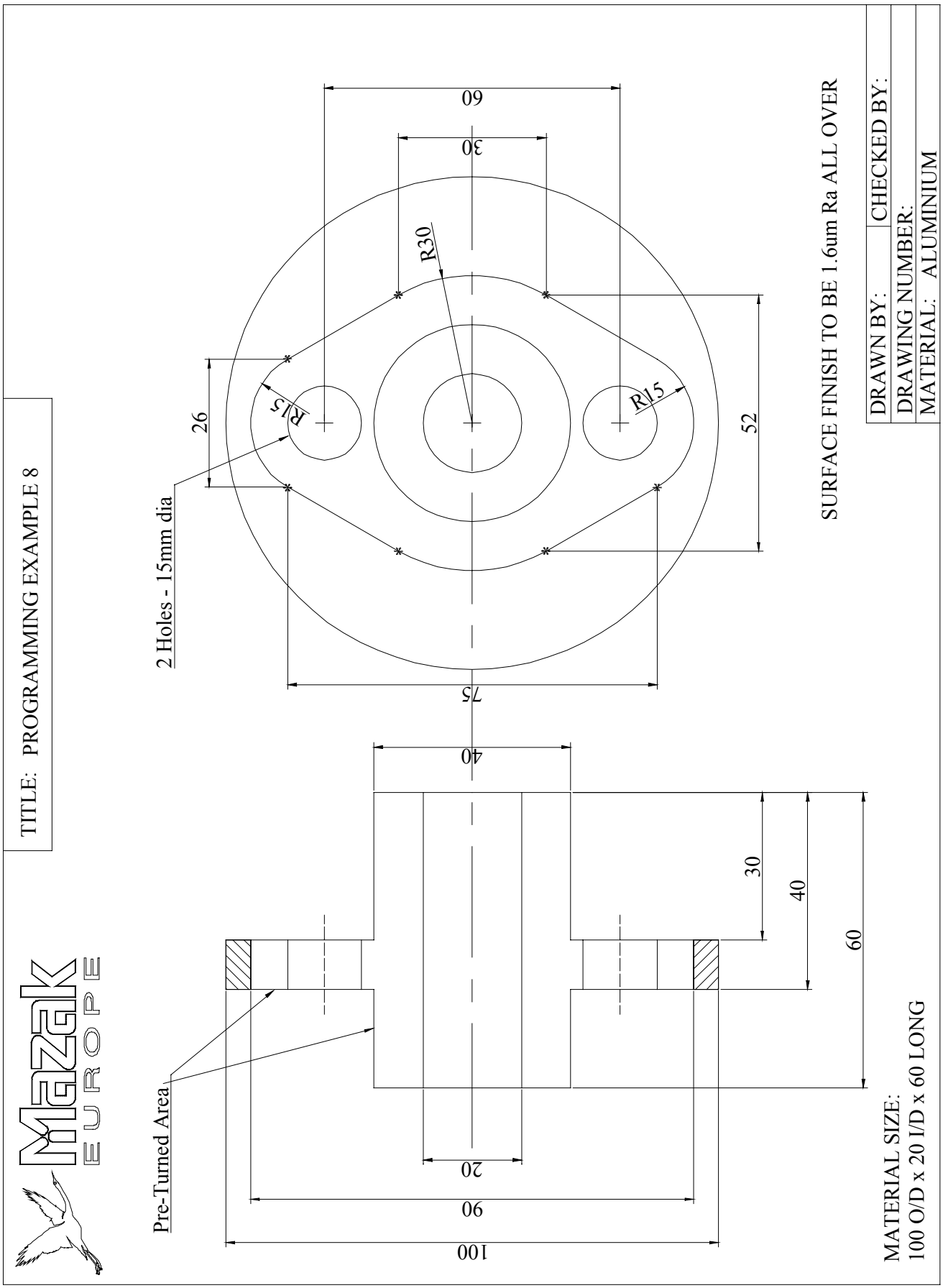
Example: If the machining into the pattern shown below is to be performed, set data shown below to one of the diagrams. (x-y-Z input)



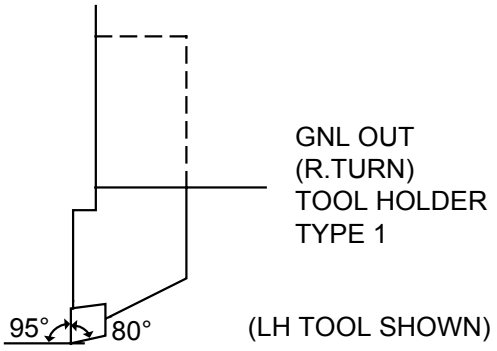
For arcs, the two patterns shown in the diagram above are usually recognized as machining patterns even if the start point, end point and radius are designated. Set radius data as a plus value if the center angle of the arc is larger than 0 degree but up to 180 degrees, or as a minus value if the center angle is larger than 180 degrees but up to 360 degrees. The statement made above also applies to mill-line right- and mill-line left-machining units.

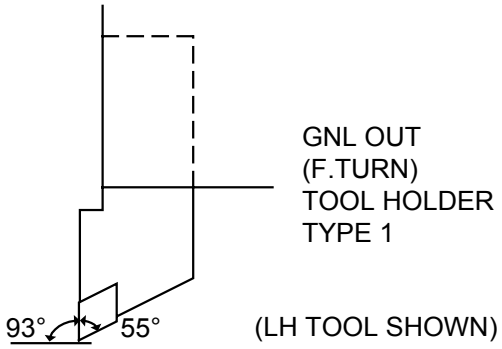
PROGRAMMING
EXAMPLE No.8

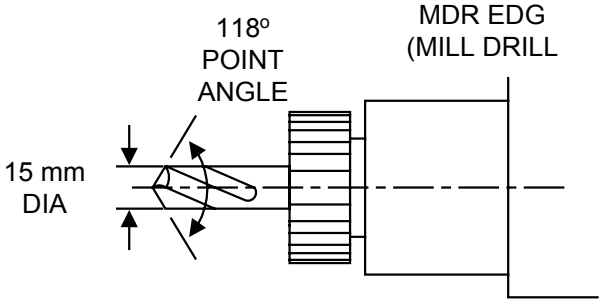


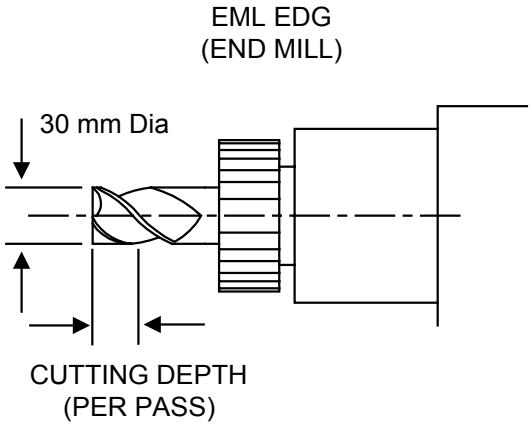

TITLE: PROGRAMMING EXAMPLE 8
SURFACE FINISH TO BE 1.6um Ra ALL OVER
DRAWN BY:
CHECKED BY:
DRAWING NUMBER:
MATERIAL: ALUMINIUM
MATERIAL SIZE:
100 O/D x 20 I/D x 60 LONG
Mazak EUROPE
2 Holes - 15mm dia
Pre-Turned Area
R30
R15
R15
60
30
26
52
75
40
30
40
60
20
90
100

TOOLS FOR PROGRAM EXAMPLE No 8



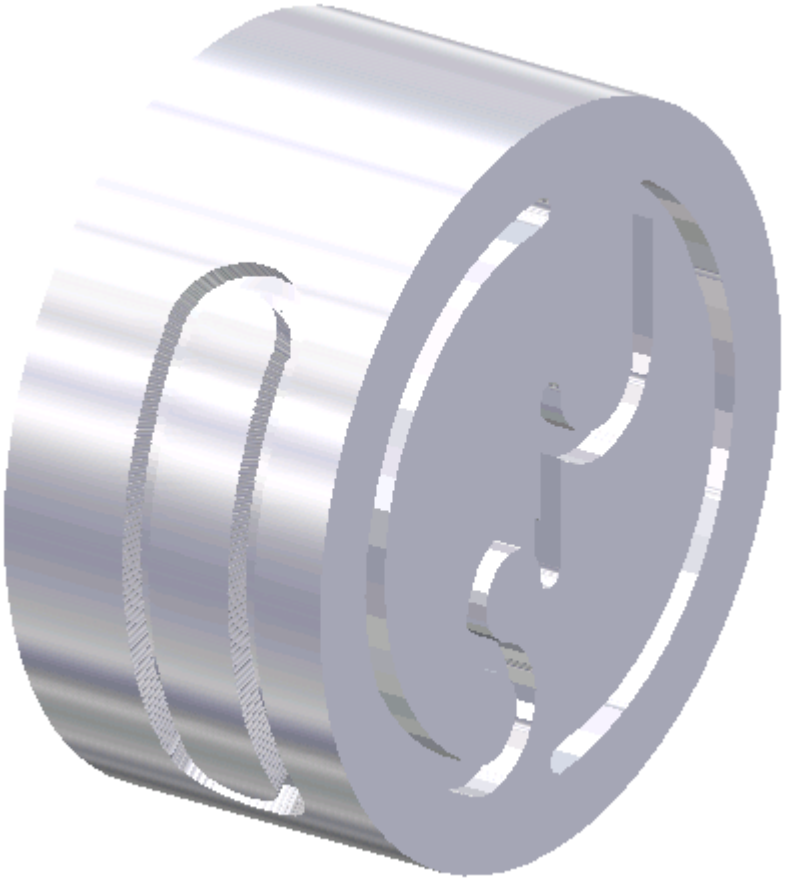


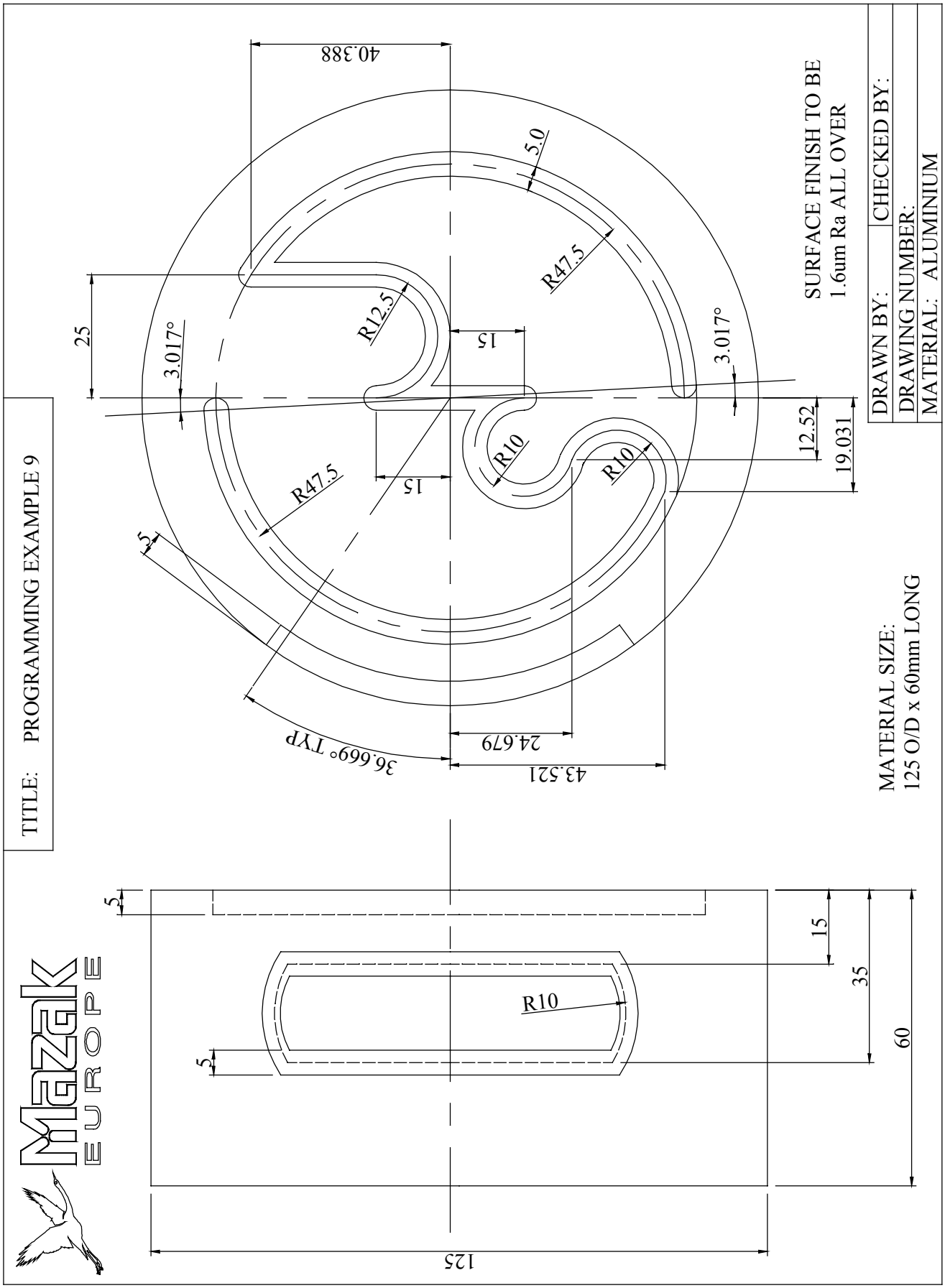




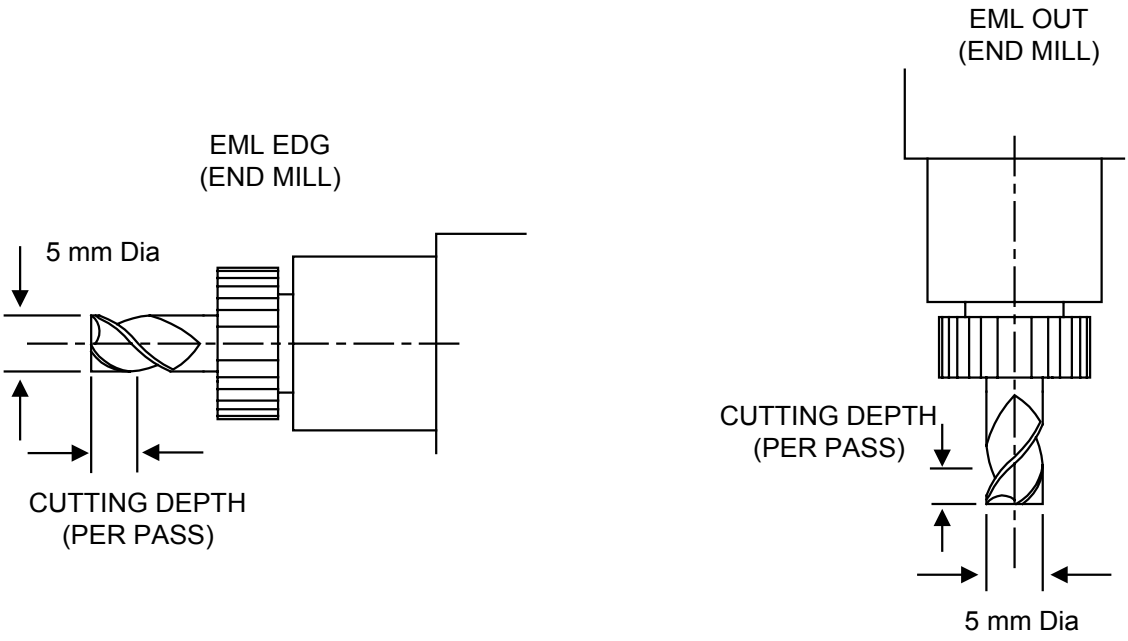
```
UNo. MAT    OD-MAX   ID-MIN   LENGTH    RPM    FIN-X   FIN-Z   WORK FACE
  0 S45C     100.      20.      60.     3000    0.4     0.1         0.

UNo. MODE
  1MTR OUT
SEQ SHP           SPT-X      SPT-Z      FPT-X      FPT-Z              RADIUS
  1LIN               *          *       100.        40.                *
  2LIN               *          *        40.        40.                *
  3LIN               *          *        40.        60.                *


UNo. MODE  # 1  # 2  # 3  # 4    # 5  # 6  # 7  # 8    # 9  #10  #11  #12
  2M         8


UNo. MODE  #  CPT-X  CPT-Z             RV    FV  R-FEED R-DEP.   R-TOOL F-TOOL
  3BAR OUT 0   100.     0.              375   468  0.4     5.5       1      2
SEQ SHP S-CNR    SPT-X      SPT-Z      FPT-X      FPT-Z   F-CNR/$ RADIUS/ø   ROUGH
  1LIN               *          *        40.        30.                *      Rgh 5
  2LIN               *          *        92.        41.                *      Rgh 5


UNo. MODE GRV-WID DEPTH  FIN-1 FIN-2   RV    FV  R-FR 1 R-FR 2  R-TOOL F-TOOL
  4LFT FCE 30.    11.    0.1   0.1     248   101  0.04    0.02   10A     10A
SEQ SHP    FPT-R/x    FPT-An/y     FPT-Z                      F-CNR     RADIUS   ROUGH
  1STP        0.       -30.         30.                                  *      Rgh 5
  2CW       -15.       -26.           *                                 30.      Rgh 5
  3LIN      -37.5      -13.           *                                  *      Rgh 5
  4CW       -37.5       13.           *                                 15.      Rgh 5
  5LIN      -15.        26.           *                                  *      Rgh 5
  6CW        15.        26.           *                                 30.      Rgh 5
  7LIN       37.5       13.           *                                  *      Rgh 5
  8CW        37.5      -13.           *                                 15.      Rgh 5
  9LIN       15.       -26.           *                                  *      Rgh 5
 10CW         0.       -30.           *                                 30.      Rgh 5


UNo. MODE  #  DIA.     DEPTH    DEP-1  DEP-2   DEP-3     V    FEED          TOOL
  5MDR FCE 0  15.      18.       9.     3.      3.       25  0.200          11A
SEQ SHP  SPT-R/x  SPT-An/y SPT-Z                                NUM. ANGLE TYPE
  1CIR   30.        0.       30.                                  2  180.    0


UNo. MODE  COUNTER   RETURN  WK.No.  CONT.   NUM.     SHIFT
  6END        1        0               0       0       0.
```

PROGRAMMING
EXAMPLE NO.9




TITLE: PROGRAMMING EXAMPLE 9
DRAWN BY:
CHECKED BY:
DRAWING NUMBER:
MATERIAL: ALUMINIUM
SURFACE FINISH TO BE
1.6um Ra ALL OVER
MATERIAL SIZE:
125 O/D x 60mm LONG
MAZAK
EUROPE
40.388
5.0
R47.5
R12.5
15
3.017°
3.017°
25
12.52
19.031
R10
R10
R47.5
15
5
36.669° TYP
24.679
43.521
5
15
35
60
R10
5
125

TOOLS FOR PROGRAM EXAMPLE No 9



```
UNo. MAT    OD-MAX   ID-MIN   LENGTH    RPM    FIN-X   FIN-Z   WORK FACE
  0 AL       125.       0.      60.     3000    0.4     0.1          0.


UNo. MODE   # 1   # 2   # 3   # 4     # 5   # 6   # 7   # 8     # 9   #10   #11   #12
  1M          8

UNo. MODE GRV-WID DEPTH   FINISH          RV     FV   R-FR 1 R-FR 2   R-TOOL F-TOOL
  2LCT FCE   5.      5.     0.1             83    101   0.033  0.016   10B    10B
SEQ SHP    FPT-R/x    FPT-An/y     FPT-Z                    F-CNR      RADIUS    ROUGH
  1STP       47.5       3.017      0.                                    *       Rgh 5
  2CCW      -43.521    19.031       *                                   47.5     Rgh 5
  3CCW      -24.679    12.52        *                                   10.      Rgh 5
  4CW       -15.        0.          *                                   -10.     Rgh 5
  5LIN       15.        0.          *                                     *      Rgh 5
  6CCW       15.      -25.          *                                   12.5     Rgh 5
  7LIN       40.388   -25.          *                                     *      Rgh 5
  8CW        47.5    -176.983       *                                   47.5     Rgh 5

UNo. MODE GRV-WID DEPTH   FINISH          RV     FV   R-FR 1 R-FR 2   R-TOOL F-TOOL
  3LCT OUT   5.      5.     0.1             83    101   0.033  0.016    7A     7A
SEQ SHP    FPT-R/x    FPT-An/y     FPT-Z                    F-CNR      RADIUS    ROUGH
  1STP       62.5       90.        15.                                   *       Rgh 5
  2LIN         *        53.331     15.                                   *       Rgh 5
  3CCW         *        53.331     35.                                   10.     Rgh 5
  4LIN         *       126.669     35.                                   *       Rgh 5
  5CCW         *       126.669     15.                                   10.     Rgh 5
  6LIN         *        90.        15.                                   *       Rgh 5

UNo. MODE   COUNTER    RETURN   WK.No.   CONT.    NUM.      SHIFT
  4END         1          0                 0          0        0.
```