



Interpolation Turning and Milling with the TNC 640



HEIDENHAIN

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HEIDENHAIN GmbH

Position: Trainer for
NC Programming



Application

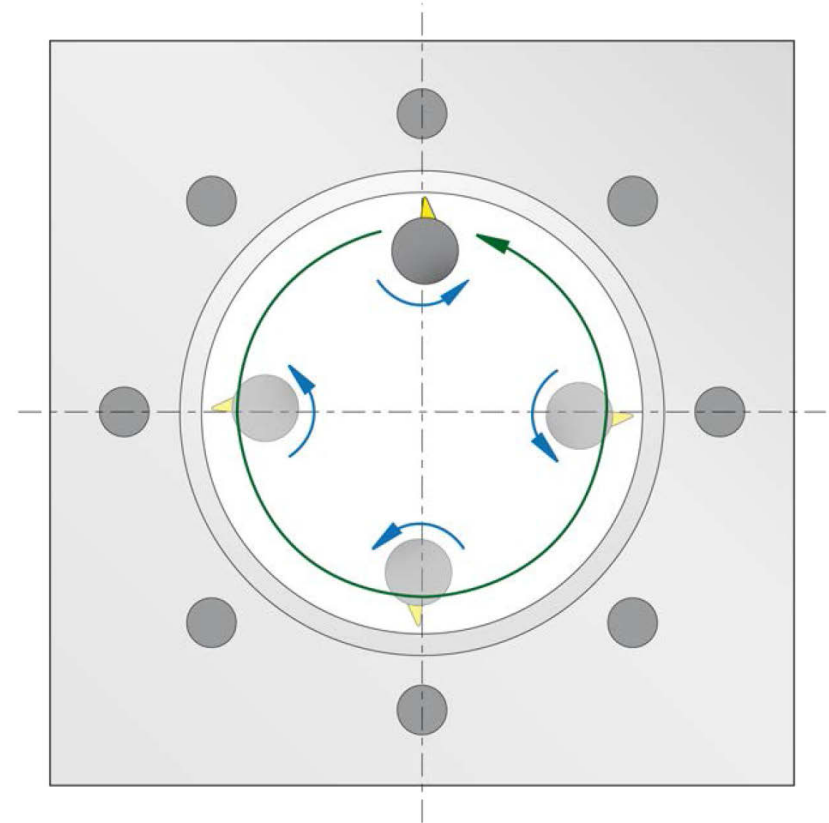
- Creation of rotationally symmetric contours in any machining plane
- There are two variants for machining:
 - Interpolation turning (**coupled** spindle)
 - Interpolation milling (spindle is **not coupled**)

Interpolation turning

- During a circular motion, the cutter orients itself away from the center for **inside machining operations**
- During a circular motion, the cutter orients itself toward the center for **outside machining operations**

Interpolation milling

- Machining of rotationally symmetric contours with a milling tool

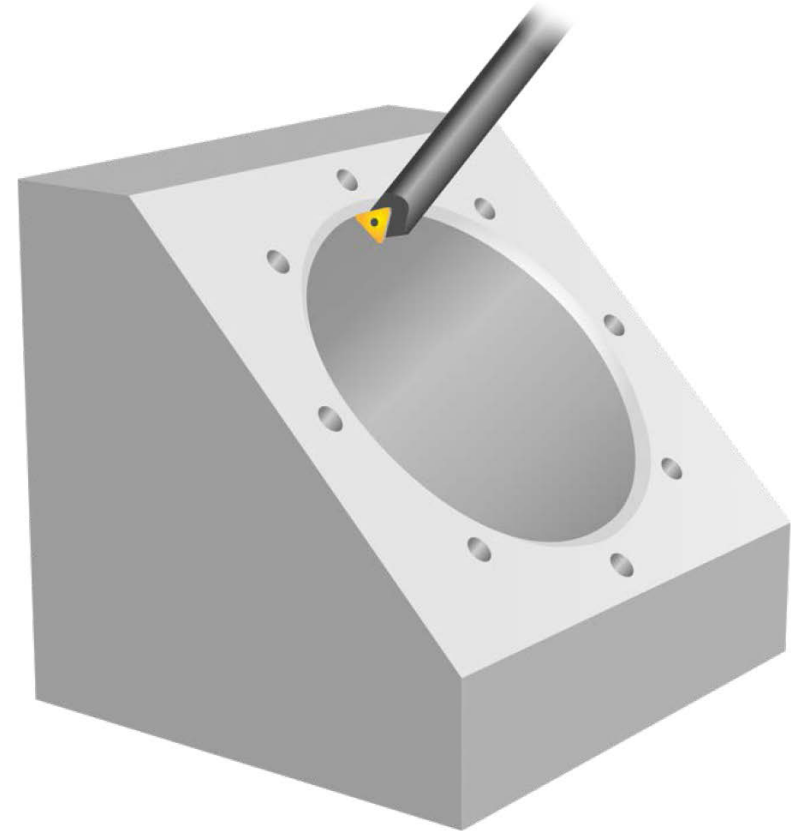




Programming:

Two cycles are available for programming:

- Cycle 292 *INTERPOLATION TURNING, CONTOUR FINISHING*
- Cycle 291 *INTERPOLATION TURNING, COUPLING*
- Cycle 292 also needs the contour to be described in a LBL as well as the assignment via Cycle 14
- Option 98 is required for interpolation turning





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Programming

Cycle 292





Application Example – Cycle 292

MW M-TS/ March 2017

Manual operation Test run DNC 11:48

```
TNC:\nc_prog\Interpolation\CYCLE.h
0 BEGIN PGM CYCLE MM
1 BLK FORM 0.1 Z X-20 Y+0 Z-40
2 BLK FORM 0.2 X+20 Y+20 Z+0
3 TOOL CALL "MILL_D16_ROUGH" Z S9000
4 M3
5 CYCL DEF 14.0 CONTOUR
6 CYCL DEF 14.1 CONTOUR LABEL1
7 CYCL DEF 292 CONTOUR.TURNG.INTRP.
  Q560=+0 ;SPINDLE COUPLING
  Q336=+0 ;ANGLE OF SPINDLE
  Q546=+3 ;CHANGE TOOL DIRECTN.
  Q529=+1 ;MACHINING OPERATION
  Q221=+0.3 ;SURFACE OVERSIZE
  Q441=+0.3 ;INFEEED
  Q449=+2000 ;FEED RATE
  Q491=+17 ;CONTOUR START RADIUS
  Q357=+0.2 ;CLEARANCE TO SIDE
  Q445=+50 ;CLEARANCE HEIGHT
8 L X+0 Y+0 Z+50 R0 FMAX M99
9 M30
10 LBL 1
11 L X+17 Z+0
12 CC X+17 Z-2
13 C X+15 Z-2 DR+
14 L X+15 Z-4.3366
15 L X+14.5732 Z-11.6141
16 CC X+16.5698 Z-11.7312
17 C X+14.5698 Z-11.7312 DR+
18 L X+14.5698 Z-20.694
19 CC X+11.5698 Z-20.694
20 C X+13.3784 Z-23.0875 DR-
21 L X+10 Z-34.4975
22 LBL 0
23 END PGM CYCLE MM
```

00:03:29 F MAX

VIEWS FURTHER VIEW OPTIONS STOP AT START START SINGLE RESET + START



Programming:

CYCL
DEF

➤ CYCL DEF key

SPECIAL
CYCLES

➤ SPECIAL CYCLES soft key

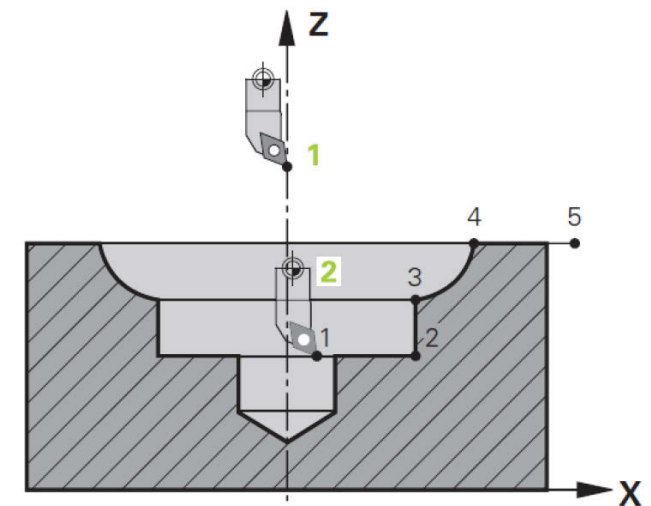
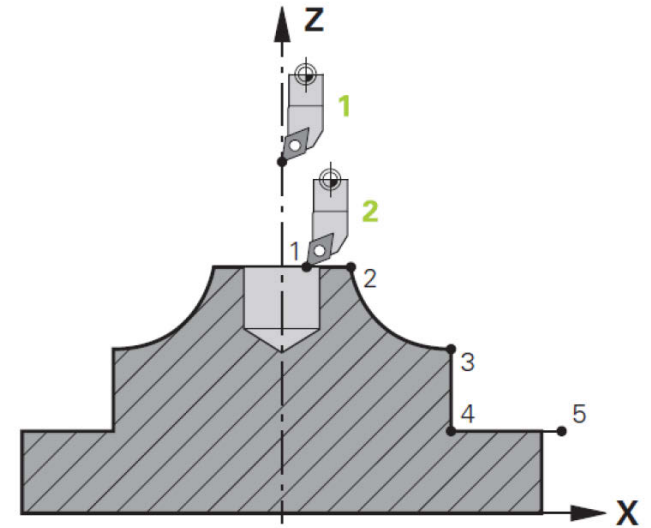
INTER-
POLATION
TURNING

➤ INTERPOLATION TURNING soft key

292



➤ Cycle 292



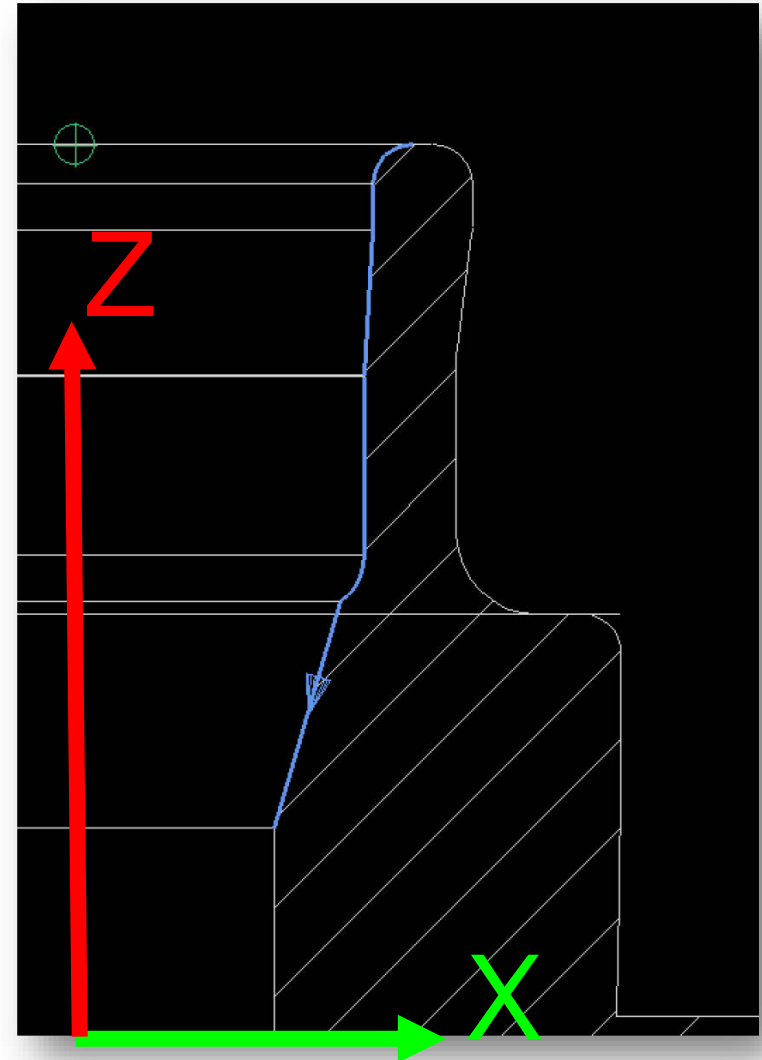


Contour:

- Cycle 292 uses a contour description to generate a rotationally symmetric machining operation in the Z/X plane (tool axis Z)
- You program the contour in a subprogram
- In the program you use a Cycle 14 to assign this contour to Cycle 292

The following must be noted when programming the contour:

- Contour description includes a radius (X axis)
- No back cutting
- Monotonously rising or falling contour description
- Programming direction = Machining direction





Contour:

- Cycle 292 uses a contour description to generate a rotationally symmetric machining operation in the Z/X plane (tool axis Z)
- You program the contour in a subprogram
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The following must be noted when programming the contour:

- Contour description includes a radius (X axis)
- No back cutting
- Monotonously rising or falling contour description
- Programming direction = Machining direction

```
LBL 1
L X+17 Z+0
CC X+17 Z-2
C X+15 Z-2 DR+
L X+15 Z-4.3366
L X+14.5732 Z-11.6141
CC X+16.5698 Z-11.7312
C X+14.5698 Z-11.7312 DR+
L X+14.5698 Z-20.694
CC X+11.5698 Z-20.694
C X+13.3784 Z-23.0875 DR-
L X+10 Z-34.4975
LBL 0
```




Tools:

Spindle coupling off, Q560=0

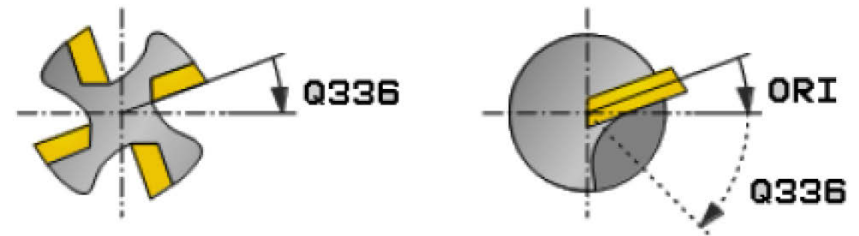
- Milling: Define the milling cutter in the tool table (tool.t) as usual

Spindle coupling on, Q560=1

- Turning:
 - Define the turning tool in the tool table (tool.t) as a milling tool
 - Define the milling tool in the tool table (tool.t) as a milling tool (in order to then use it as a turning tool)
 - Define the turning tool in the turning tool table (toolturn.trn)

→ See the manual for the tool definition in tool.t and toolturn.trn

TO	ORI	P-ANGLE





End mill

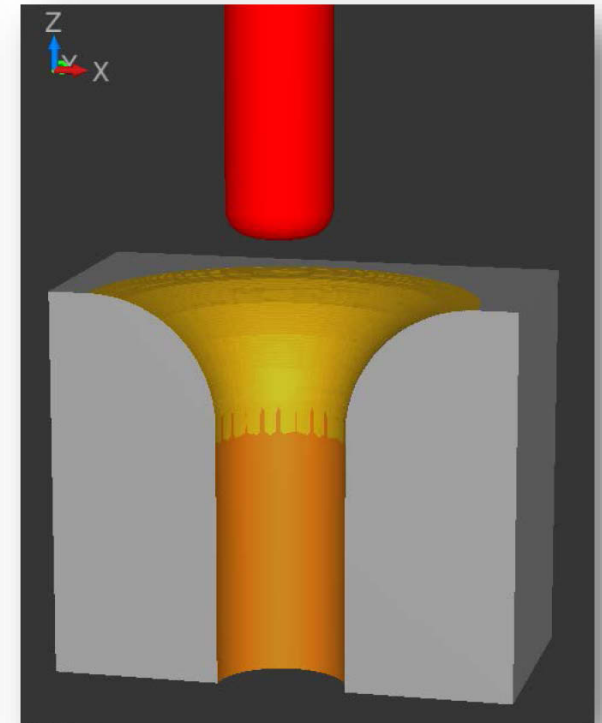
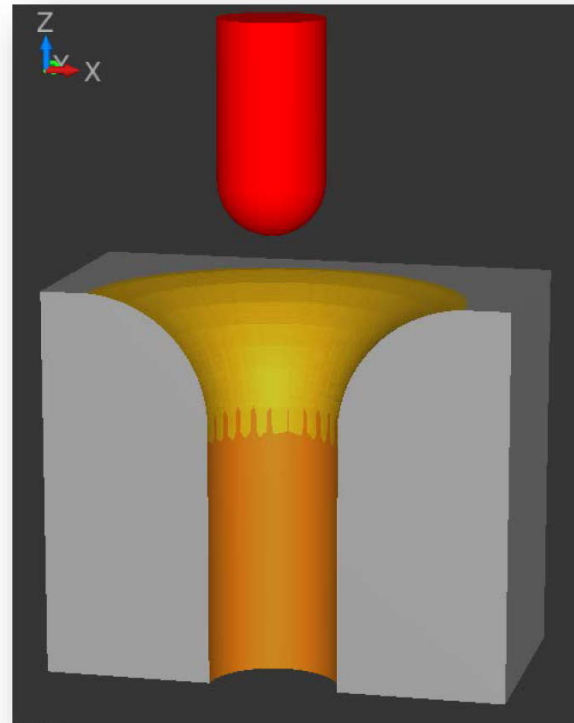
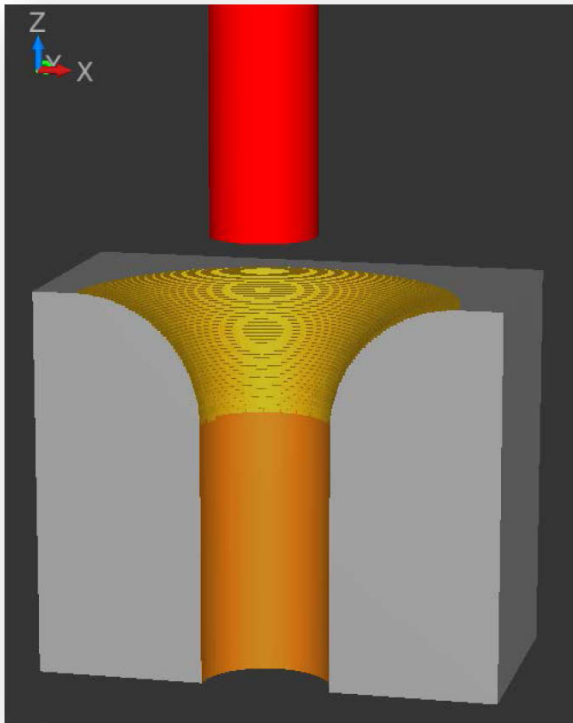
Ball-nose cutter

Toroid cutter

$R > 0 / R_2 = 0$

$R = R_2$

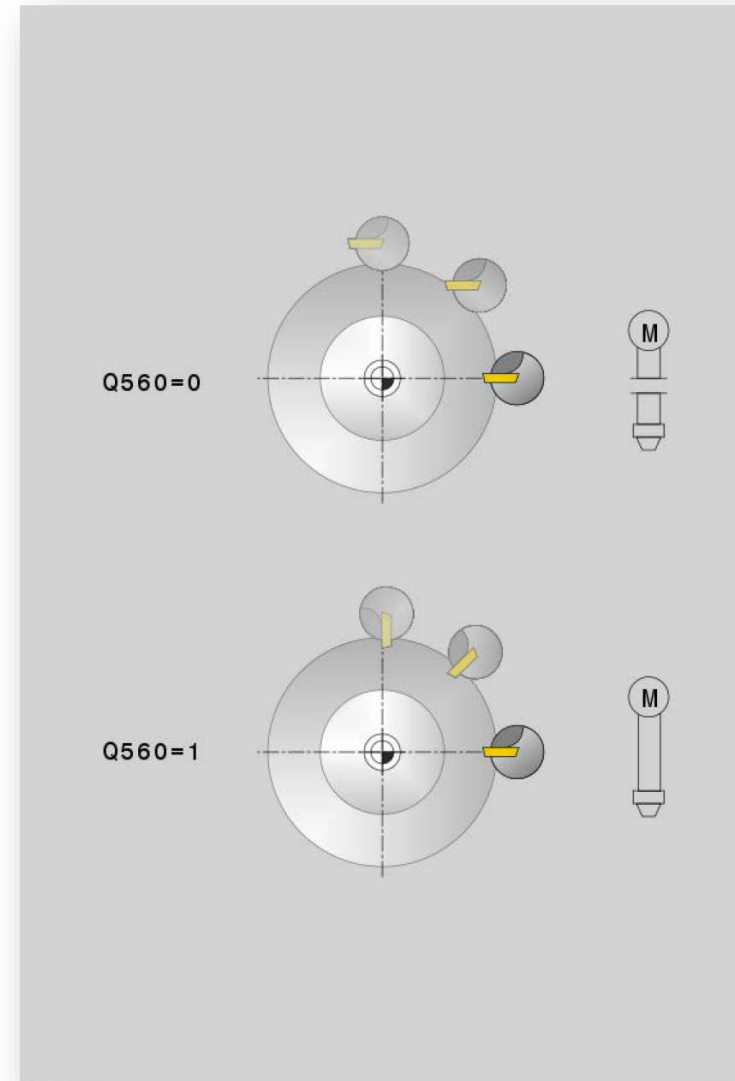
$R_2 > 0 < R$





Programming:

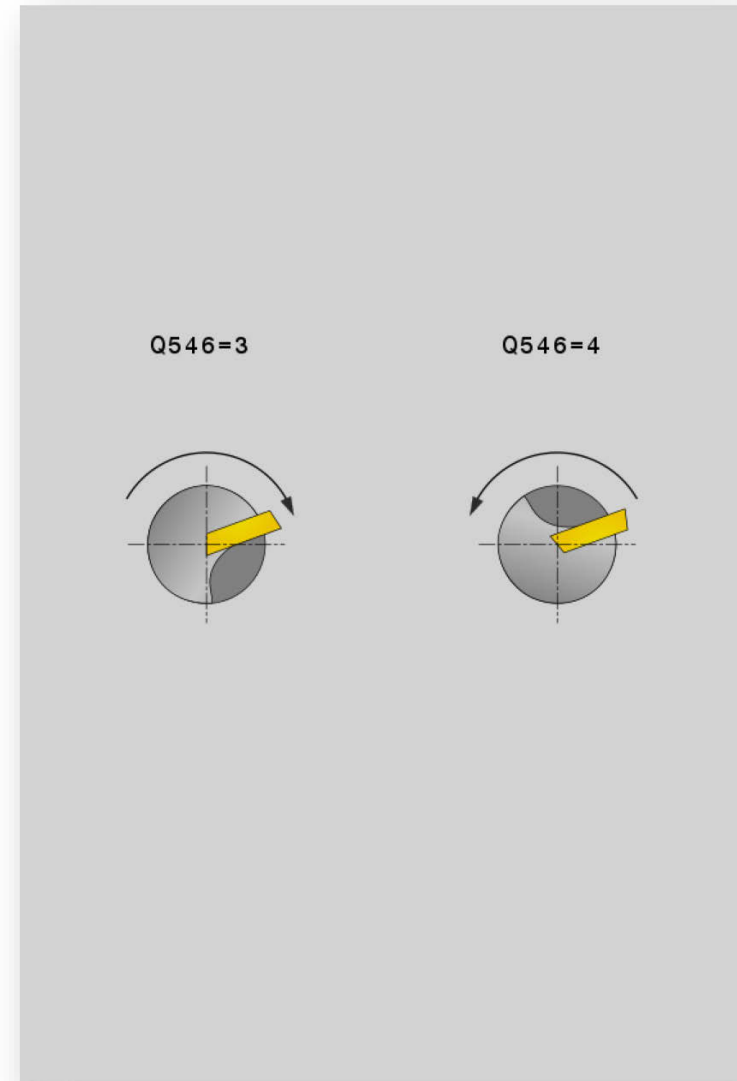
- You use **Q560** to specify whether the spindle should be coupled or not during machining
- Interpolation turning **Q560 = 1**
- Interpolation milling **Q560 = 0**





Programming:

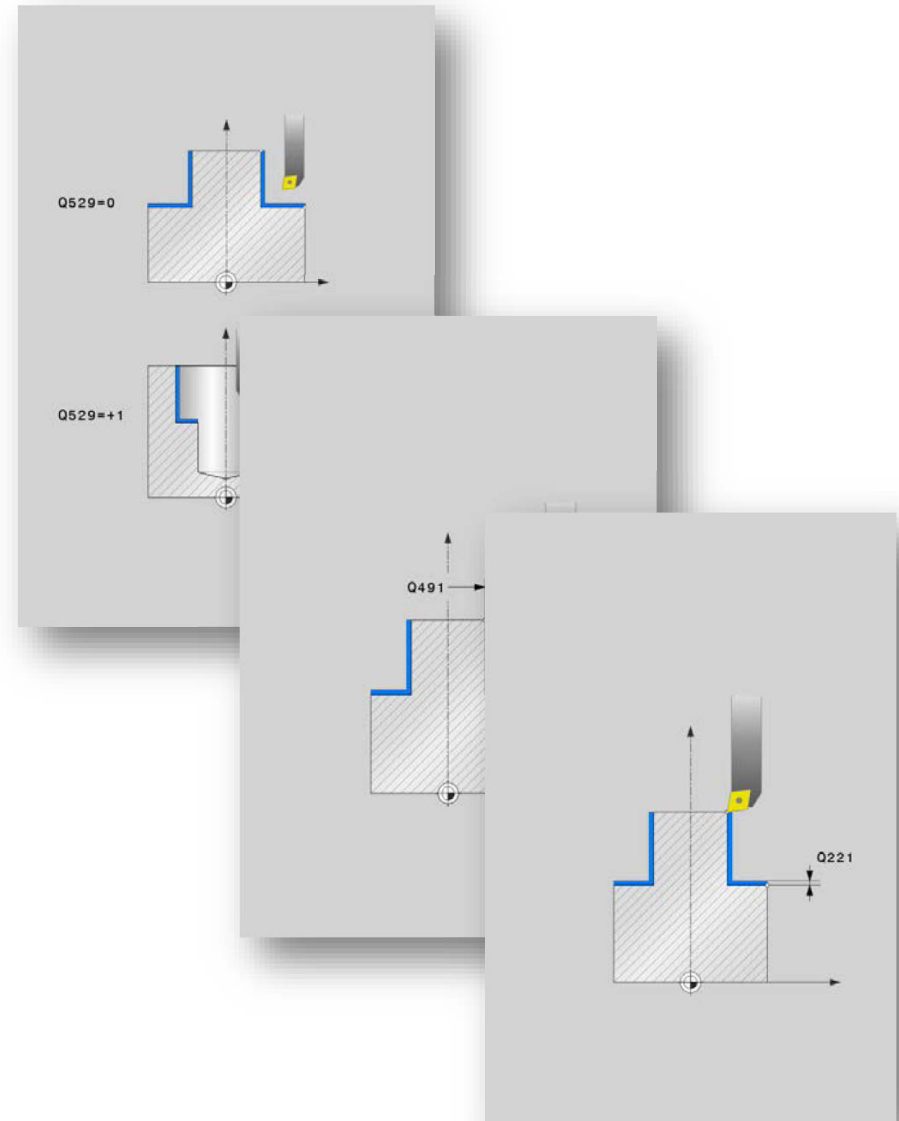
- You use **Q545** to specify the machining direction
- For interpolation turning you have to enter 3 or 4 here, depending on the position of the cutting edge
- For interpolation milling, the entries 3 and 4 specify whether the contour is machined with climb milling or with up-cut milling





Programming:

- You use **Q529** to specify the side to be machined
 - Outside machining **Q529 = 0**
 - Inside machining **Q529 = 1**
- In **Q491** you program the starting point for machining. This information is contained in the contour label
- In **Q221** you define the oversize for this operation

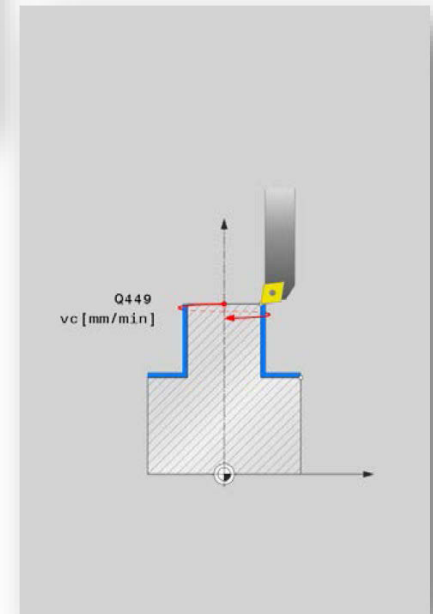
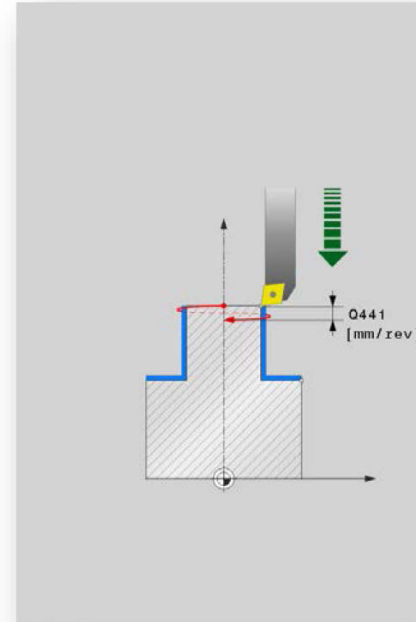




Programming:

- You define the infeed per revolution in **Q441** (mm/rev)

- **Q449** Feed rate in reference to the contour starting point
The feed rate is adapted as follows depending on the type of machining (Q529):
 - **Q529 = 1**: Feed rate of the tool center-line path is reduced for inside machining
 - **Q529 = 0**: Feed rate of the tool center-line path is increased for outside machining



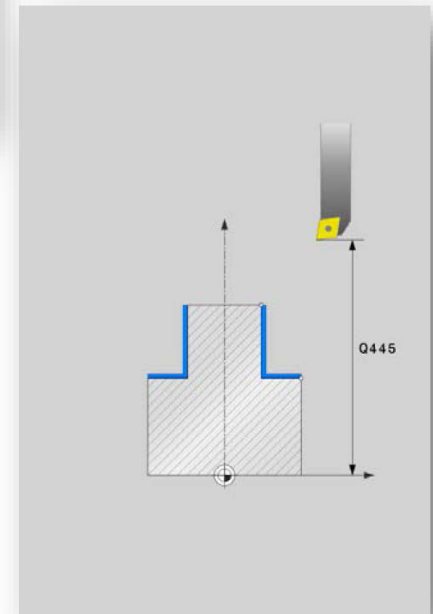
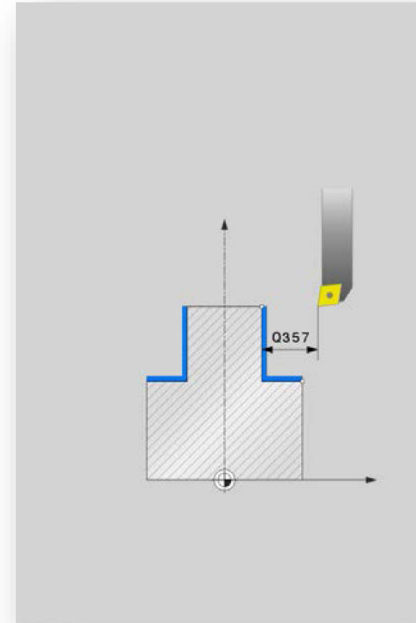


Programming:

- **Q357** Clearance to side
- **Q445** Clearance height that is positioned to after the machining operation

Cycle call:

- Center the tool
- Call the cycle using one of the following functions:
 - M99
 - CYCL CALL
 - CYCL CALL POS
 - CYCL CALL PAT





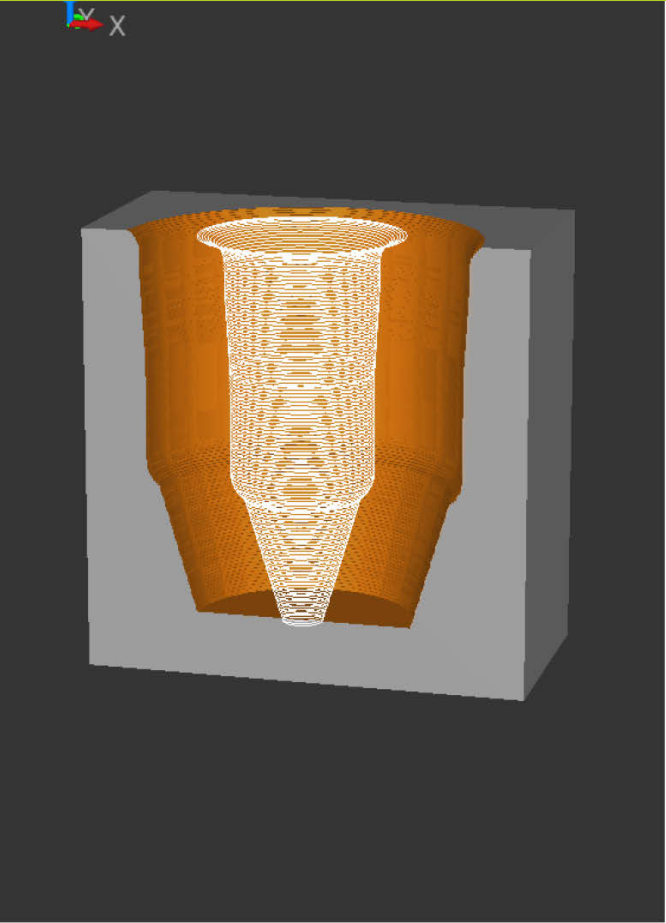
Application Example – Cycle 292

MW M-TS/ March 2017

Manual operation Test run 11:48

Roughing with end mill D16 (without spindle coupling)

```
TNC: \nc
0 BEGIN PGM CYCLE MM
1 BLK FORM 0.1 Z X-20 Y+0 Z-40
2 BLK FORM 0.2 X+20 Y+20 Z+0
3 TOOL CALL "MILL_D16_ROUGH" Z S9000
4 M3
5 CYCL DEF 14.0 CONTOUR
6 CYCL DEF 14.1 CONTOUR LABEL1
7 CYCL DEF 292 CONTOUR.TURNG.INTRP.
  Q560=+0 ;SPINDLE COUPLING
  Q336=+0 ;ANGLE OF SPINDLE
  Q546=+3 ;CHANGE TOOL DIRECTN.
  Q529=+1 ;MACHINING OPERATION
  Q221=+0.3 ;SURFACE OVERSIZE
  Q441=+0.3 ;INFEEP
  Q449=+2000 ;FEED RATE
  Q491=+17 ;CONTOUR START RADIUS
  Q357=+0.2 ;CLEARANCE TO SIDE
  Q445=+50 ;CLEARANCE HEIGHT
8 L X+0 Y+0 Z+50 R0 FMAX M99
9 M30
10 LBL 1
11 L X+17 Z+0
12 CC X+17 Z-2
13 C X+15 Z-2 DR+
14 L X+15 Z-4.3366
15 L X+14.5732 Z-11.6141
16 CC X+16.5698 Z-11.7312
17 C X+14.5698 Z-11.7312 DR+
18 L X+14.5698 Z-20.694
19 CC X+11.5698 Z-20.694
20 C X+13.3784 Z-23.0875 DR-
21 L X+10 Z-34.4975
22 LBL 0
23 END PGM CYCLE MM
```



00:03:29 F MAX

VIEWS FURTHER VIEW OPTIONS STOP AT START START SINGLE RESET + START



Application Example – Cycle 292

MW M-TS/ March 2017

Expanded tool menu Test run 12:47

Finishing with turning tool (with spindle coupling)

```
TNC: \nc
9 STOP
10 M5
11 TOOL CALL "TURN_FINISH"
12 CYCL DEF 292 CONTOUR.TURNG.INTRP.
    Q560=+1 ;SPINDLE COUPLING
    Q336=+0 ;ANGLE OF SPINDLE
    Q546=+3 ;CHANGE TOOL DIRECTN.
    Q529=+1 ;MACHINING OPERATION
    Q221=+0 ;SURFACE OVERSIZE
    Q441=+0.3 ;INFEEED
    Q449=+25000 ;FEED RATE
    Q491=+17 ;CONTOUR START RADIUS
    Q357=+0.2 ;CLEARANCE TO SIDE
    Q445=+50 ;CLEARANCE HEIGHT
13 L X+0 Y+0 Z+50 R0 FMAX M99
14 M30
15 LBL 1
16 L X+17 Z+0
17 CC X+17 Z-2
18 C X+15 Z-2 DR+
19 L X+15 Z-4.3366
20 L X+14.5732 Z-11.6141
21 CC X+16.5698 Z-11.7312
22 C X+14.5698 Z-11.7312 DR+
23 L X+14.5698 Z-20.694
24 CC X+11.5698 Z-20.694
25 C X+13.3784 Z-23.0875 DR-
26 L X+10 Z-34.4975
27 LBL 0
28 END PGM CYCLE MM
```

00:02:40 F MAX

VIEWS FURTHER VIEW OPTIONS STOP AT START START SINGLE RESET + START



Application Example – Cycle 292

MW M-TS/ March 2017

08:12

Application in a tilted working plane

```
TNC: \nc
Q357=+2 ;CLEARANCE TO SIDE
Q200=+2 ;SET-UP CLEARANCE
Q204=+50 ;2ND SET-UP CLEARANCE
Q347=+0 ;1ST LIMIT
Q348=+0 ;2ND LIMIT
Q349=+0 ;3RD LIMIT
Q220=+0 ;CORNER RADIUS
Q368=+0 ;ALLOWANCE FOR SIDE
Q338=+0 ;INFEEED FOR FINISHING
11 L X-25 Y+0 R0 FMAX M99
12 PLANE RESET STAY
13 CYCL DEF 7.0 DATUM SHIFT
14 CYCL DEF 7.1 X+35
15 CYCL DEF 7.2 Z-20
16 CYCL DEF 7.3 Y+20
17 L X+0 Y+0 Z+100 R0 FMAX
18 PLANE SPATIAL SPA+0 SPB-45 SPC+180 MOVE
DIST100 FMAX
19 L X-25 Y+0 R0 FMAX M99
20 CYCL DEF 14.0 CONTOUR
21 CYCL DEF 14.1 CONTOUR LABEL1
22 CYCL DEF 292 CONTOUR.TURNG.INTRP.
Q560=+0 ;SPINDLE COUPLING
Q336=+0 ;ANGLE OF SPINDLE
Q546=+3 ;CHANGE TOOL DIRECTN.
Q529=+1 ;MACHINING OPERATION
Q221=+0.3 ;SURFACE OVERSIZE
Q441=+0.3 ;INFEEED
Q449=+25000 ;FEED RATE
Q491=+17 ;CONTOUR START RADIUS
Q357=+0.2 ;CLEARANCE TO SIDE
Q445=+50 ;CLEARANCE HEIGHT
23 L X+0 Y+20 Z+50 R0 FMAX M99
24 PLANE RESET STAY
```

00:03:57 F MAX

VIEWS FURTHER VIEW OPTIONS STOP AT START START SINGLE RESET + START



Application Example – Cycle 292

MW M-TS/ March 2017

Application with point pattern

```
TNC: \nc
7 STOP
8 TOOL CALL "BALL_MILL_D8" Z S12000
9 M3
10 CYCL DEF 14.0 CONTOUR
11 CYCL DEF 14.1 CONTOUR LABEL1
12 CYCL DEF 292 CONTOUR.TURNG.INTRP.
    Q560=+0 ;SPINDLE COUPLING
    Q336=+0 ;ANGLE OF SPINDLE
    Q546=+3 ;CHANGE TOOL DIRECTN.
    Q529=+1 ;MACHINING OPERATION
    Q221=+0 ;SURFACE OVERSIZE
    Q441=+0.3 ;INFEEED
    Q449=+10000 ;FEED RATE
    Q491=+15 ;CONTOUR START RADIUS
    Q357=+0.2 ;CLEARANCE TO SIDE
    Q445=+50 ;CLEARANCE HEIGHT
13 CALL LBL "DRILL_POS"
14 M30
15 LBL "DRILL_POS"
16 PATTERN DEF
    CIRC1( X+0 Y+0 D200 START+0 NUM14 Z+0 )
17 L X+100 Y+0 Z+50 R0 FMAX
18 CYCL CALL PAT FMAX
19 LBL 0
20 LBL 1
21 L X+15 Z+0
22 L X+5
23 RND R9.9
24 L Z-11
25 LBL 0
26 END PGM CYCLE2 MM
```

08:29

00:13:22 F MAX

VIEWS FURTHER VIEW OPTIONS STOP AT START START SINGLE RESET + START



Application Example – Cycle 292

MW M-TS/ March 2017

Application with point pattern

```
TNC: \nc
7 STOP
8 TOOL CALL "BALL_MILL_D8" Z S12000
9 M3
10 CYCL DEF 14.0 CONTOUR
11 CYCL DEF 14.1 CONTOUR LABEL1
12 CYCL DEF 292 CONTOUR.TURNG.INTRP.
    Q560=+0 ;SPINDLE COUPLING
    Q336=+0 ;ANGLE OF SPINDLE
    Q546=+3 ;CHANGE TOOL DIRECTN.
    Q529=+1 ;MACHINING OPERATION
    Q221=+0 ;SURFACE OVERSIZE
    Q441=+0.3 ;INFEEED
    Q449=+10000 ;FEED RATE
    Q491=+15 ;CONTOUR START RADIUS
    Q357=+0.2 ;CLEARANCE TO SIDE
    Q445=+50 ;CLEARANCE HEIGHT
13 CALL LBL "DRILL_POS"
14 M30
15 LBL "DRILL_POS"
16 PATTERN DEF
    CIRC1( X+0 Y+0 D200 START+0 NUM14 Z+0 )
17 L X+100 Y+0 Z+50 R0 FMAX
18 CYCL CALL PAT FMAX
19 LBL 0
20 LBL 1
21 L X+15 Z+0
22 L X+5
23 RND R9.9
24 L Z-11
25 LBL 0
26 END PGM CYCLE2 MM
```

08:31

00:13:22 F MAX

VIEWS FURTHER VIEW OPTIONS STOP AT START START SINGLE RESET + START

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Programming

Cycle 291





Application Example – Cycle 291

MW M-TS/ March 2017

Expanded tool mana... **Test run** DNC 14:08

TNC:\nc_prog\...\Schichten_Interpolationsdrehen_1.H

```
2 ; TEIL-NAME : INTERPOLATIONSSTREHEN_CAM
3 ; PROGRAMM-NR. : 1
4 ; DATUM - ZEIT : 02-MAR-2017 - 13:58:13
5 ; VERWENDETE WERKZEUGE:
6 ; - T77 - DOVE TAIL MILL D26.678 R0.400
7 * WERKZEUGE/JOBS:
8 TOOL CALL "TURN_FINISH_1".1
9 * - SCHLICHTEN-INTERPOLATIONSSTREHEN-1
10 FN 0: Q1 =+30000 ; EIL-VORSCHUB
11 FN 0: Q2 =+25000 ; XY-VORSCHUB
12 FN 0: Q3 =+25000 ; Z-VORSCHUB
13 FN 0: Q4 =+50000 ; RUECKZUG-VORSCHUB
14 CYCL DEF 32.0 TOLERANCE
15 CYCL DEF 32.1 T0.01
16 CYCL DEF 32.2 HSC-MODE:0 TA+1.5
17 ; POSITION 2 BEI NP 1
18 CALL LBL 250 ;RESET
19 CYCL DEF 7.0 DATUM SHIFT
20 CYCL DEF 7.1 X+0
21 CYCL DEF 7.2 Y+0
22 CYCL DEF 7.3 Z+0
23 PLANE SPATIAL SPA+0 SPB+0 SPC+0 TURN F9999
SEQ- TABLE ROT
24 L X+5.5645 Y+35.6082 FMAX
25 CYCL DEF 291 COUPLG.TURNG.INTERP.
    Q560=+1 ;SPINDLE COUPLING
    Q336=+0 ;ANGLE OF SPINDLE
    Q216=+0 ;CENTER IN 1ST AXIS
    Q217=+0 ;CENTER IN 2ND AXIS
    Q561=+1 ;CONVERT FROM TURNING TOOL
26 M99
27 L Z+15 R0 FMAX
28 L Z+1.4 FMAX
29 L Z-0.6 FQ3
```

00:00:44 F MAX

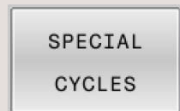
VIEWS FURTHER VIEW OPTIONS STOP AT START START SINGLE RESET + START



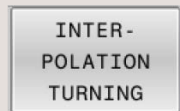
Programming:



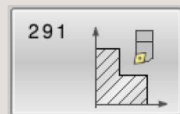
➤ CYCL DEF key



➤ SPECIAL CYCLES soft key



➤ INTERPOLATION TURNING soft key



➤ Cycle 291

Cycle 291 is CALL-active, meaning that after you have programmed the cycle, you must call it with M99 or with CYCL CALL.



Contour:

- Cycle 291 couples the spindle to a circular movement (center of rotation is defined in the cycle)
- The contour must be fully programmed, e.g. 3-D spiral path
- You must switch coupling on before machining
- You must switch coupling off after machining

Sample cases:

- Contour description with back cutting
- Contour description from CAM system

Please note:

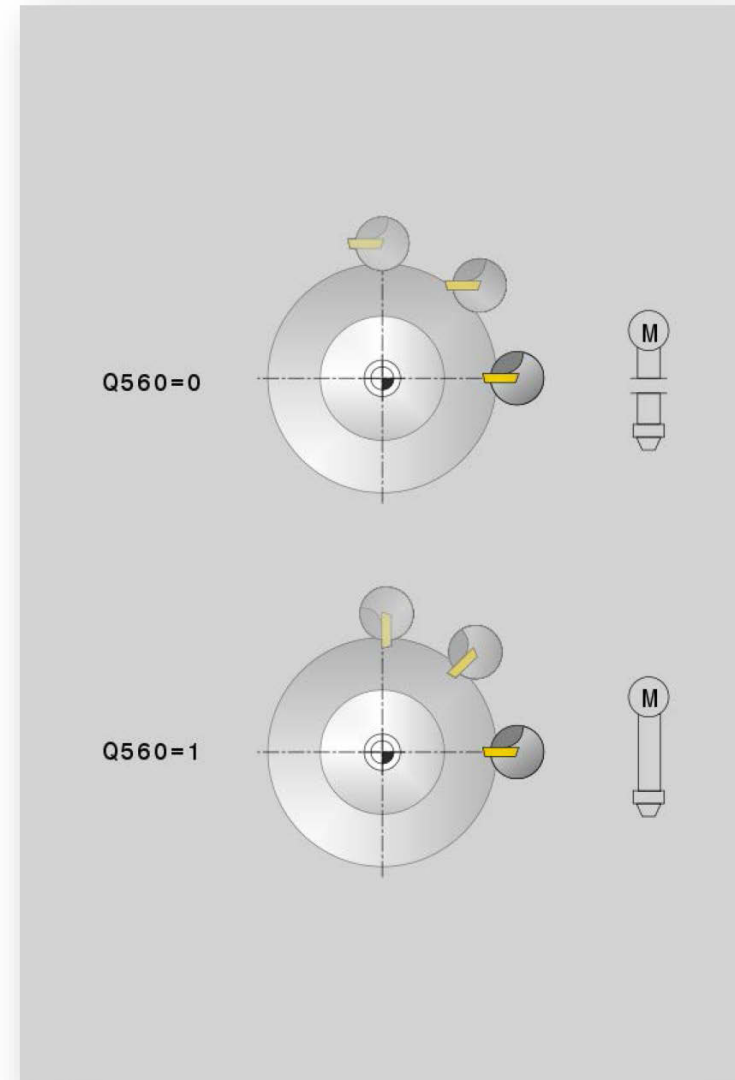
- Rotational direction (CW or CCW), machining direction (up or down), etc. are determined by the contour description.

```
L X-6.7076 Y-32.2786 Z-1.1184
L X-6.3538 Y-32.3518 Z-1.1211
L X-5.9983 Y-32.4206 Z-1.1226
L X-5.6423 Y-32.4861 Z-1.1253
L X-5.2228 Y-32.5571 Z-1.1267
L X-4.8027 Y-32.6238 Z-1.1299
L X-4.3808 Y-32.6841 Z-1.1315
L X-3.9583 Y-32.74 Z-1.1349
L X-3.5964 Y-32.7827 Z-1.1363
L X-3.2341 Y-32.8221 Z-1.1391
L X-2.8709 Y-32.8568 Z-1.1405
L X-2.5075 Y-32.8882 Z-1.1433
L X-2.1434 Y-32.9149 Z-1.1448
L X-1.7791 Y-32.9383 Z-1.1475
L X-1.4143 Y-32.9568 Z-1.149
L X-1.0493 Y-32.9722 Z-1.1518
L X-0.6213 Y-32.9847 Z-1.1545
L X-0.196 Y-32.9915 Z-1.157
L X+0.2322 Y-32.9928 Z-1.1595
L X+0.6575 Y-32.9885 Z-1.162
L X+1.0211 Y-32.9801 Z-1.1635
L X+1.3846 Y-32.9685 Z-1.1662
L X+1.7476 Y-32.9522 Z-1.1677
L X+2.1106 Y-32.9326 Z-1.1705
L X+2.4729 Y-32.9082 Z-1.1719
L X+2.8351 Y-32.8806 Z-1.1747
L X+3.1964 Y-32.8484 Z-1.1762
L X+3.5575 Y-32.8129 Z-1.1789
L X+3.9846 Y-32.7652 Z-1.1815
```



Programming:

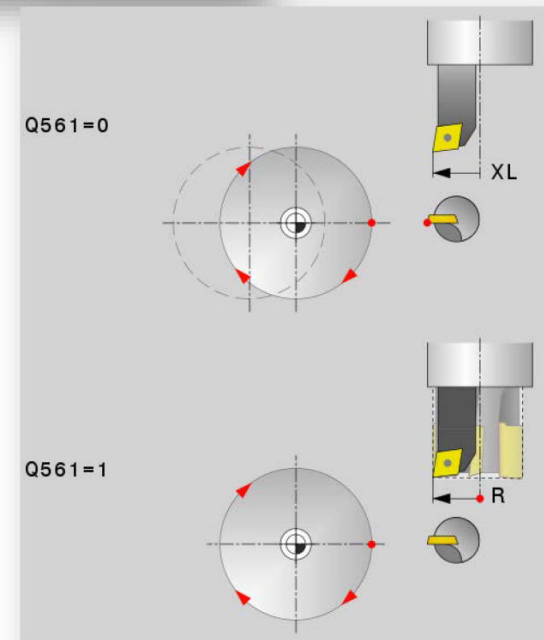
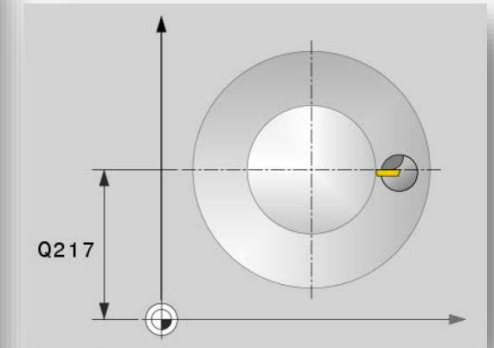
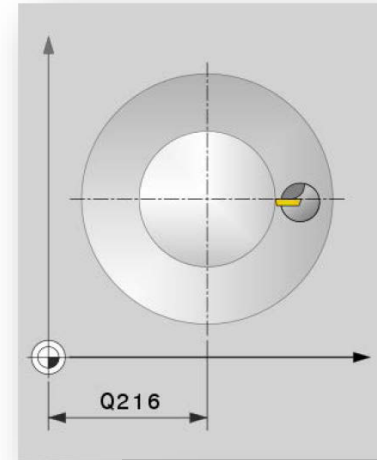
- You use **Q560** to specify whether the spindle should be coupled or not during machining
- Interpolation turning **Q560 = 1**
- Interpolation milling **Q560 = 0**





Programming:

- With **Q216** (center of rotation in X) and **Q217** (center of rotation in Y), you define the center of rotation that the tool points to or away from.
- **Q561** supports you in the programming of the turning tool that was defined in toolturn.trn.
 - **Q561=0**: The value XL from toolturn.trn is used as XL.
 - RR/RL can not be used
 - Motion of the tool center point (TCP) must be programmed without spindle coupling
 - **Q561=1**: The value XL from toolturn.trn is interpreted as a radius R.
 - RR/RL can be used
 - Recommended variant





Before machining:

- You must switch spindle coupling on before machining

```
19 CYCL DEF 7.0 DATUM SHIFT
20 CYCL DEF 7.1 X+0
21 CYCL DEF 7.2 Y+0
22 CYCL DEF 7.3 Z+0
23 PLANE SPATIAL SPA+0 SPB+0 SPC+0 TURN F9999
   SEQ- TABLE ROT
24 L X+5.5645 Y+35.6082 FMAX
25 CYCL DEF 291 COUPLG.TURNG.INTERP.
   Q560=+1 ;SPINDLE COUPLING
   Q336=+0 ;ANGLE OF SPINDLE
   Q216=+0 ;CENTER IN 1ST AXIS
   Q217=+0 ;CENTER IN 2ND AXIS
   Q561=+1 ;CONVERT FROM TURNING TOOL
26 M99
27 L Z+15 R0 FMAX
28 L Z+1.4 FMAX
29 L Z-0.6 FQ3
30 L FQ3
31 L X+5.5552 Y+35.4841
32 L X+5.5012 Y+35.123
33 L X+5.408 Y+34.77
34 L X+5.2768 Y+34.4293
35 L X+5.1091 Y+34.105
```

After machining:

- You must switch spindle coupling off after machining

```
13945 L X-3.9703 Y+41.4282
13946 L X-3.9656 Y+41.9446
13947 L X-3.957 Y+42.09
13948 L FQ4
13949 L Z-21.5194
13950 L Z-3.5194 FMAX
13951 L Z+15 FMAX
13952 CYCL DEF 291 COUPLG.TURNG.INTERP.
   Q560=+0 ;SPINDLE COUPLING
   Q336=+0 ;ANGLE OF SPINDLE
   Q216=+0 ;CENTER IN 1ST AXIS
   Q217=+0 ;CENTER IN 2ND AXIS
   Q561=+1 ;CONVERT FROM TURNING TOOL
13953 M99
13954 CYCL DEF 32.0 TOLERANCE
13955 CYCL DEF 32.1
13956 CALL LBL 251 ;RESET TURN
13957 M30
13958 ;
```

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Tips and Tricks



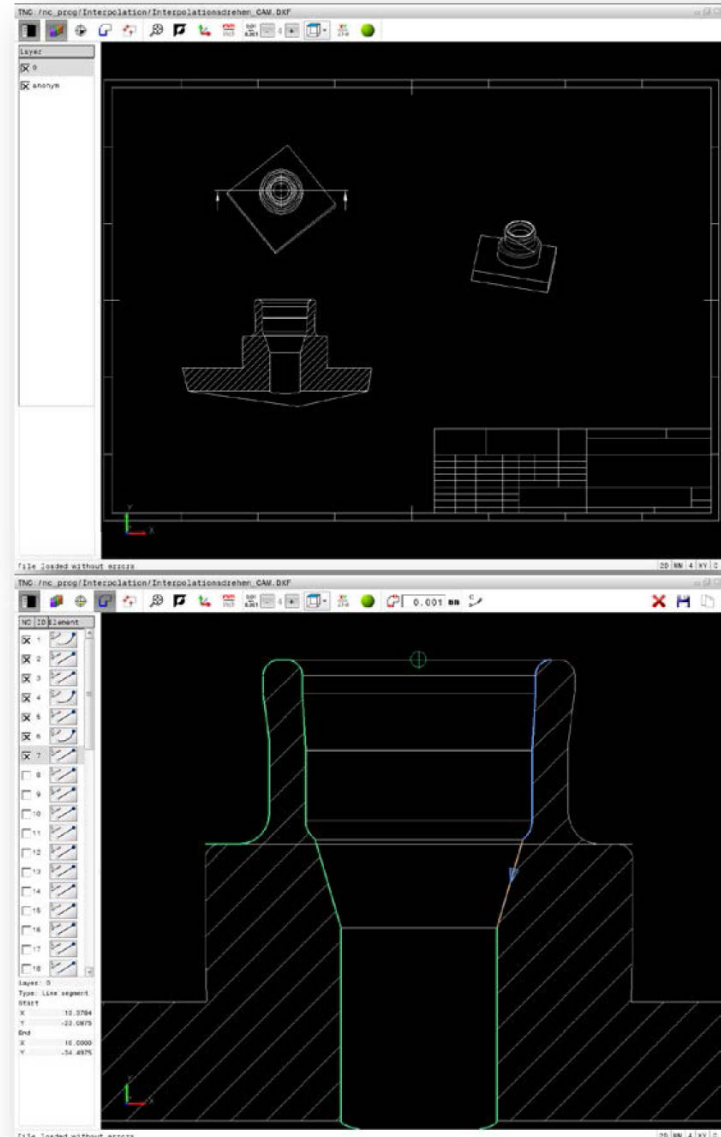


Using a Contour from a DXF File

MW M-TS/ March 2017

Contour creation:

- DXF file with description of the workpiece contours
- Set the datum to the center of machining
- Now select the desired contour and save it





Using a Contour from a DXF File

MW M-TS/ March 2017

Contour creation:

- In the machining program you use the FIND and the FIND and REPLACE functions to replace the Y coordinates with the Z coordinates

```
TNC:\nc_prog\Interpolation\CONT.H BEGIN PGM CONT MM
->CONT.H END PGM CONT MM
minimum arc radius = +2.0000
5 :
6 : ALL_BLK_FORM from complete file
7 BLK FORM 0.1 Z X-117.7002 Y-143.8295 Z-0.025
8 BLK FORM 0.2 X+282.2998 Y+143.1705 Z+0.025
9 :
10 : SEL_BLK_FORM from selection
11 BLK FORM 0.1 Z X+8.5698 Y-34.4975 Z-0.025
12 BLK FORM 0.2 X+19 Y+0 Z+0.025
13 :
14 L X+17 Y+0
15 CC X+17 Y-2
16 C X+15 Y-2 DR+
17 L X+15 Y-4.3366
18 L X+14.5732 Y-11.6141
19 CC X+16.5698 Y-11.7312
20 C X+14.5698 Y-11.7312 DR+
21 L X+14.5698 Y-20.694
22 CC X+11.5698 Y-20.694
23 C X+13.3784 Y-23.0875 DR-
24 L X+10 Y-34.4975
25 END PGM CONT MM
```

```
TNC:\nc_prog\Interpolation\CONT.H BEGIN PGM CONT MM
->CONT.H END PGM CONT MM
minimum arc radius = +2.0000
5 :
6 : ALL_BLK_FORM from complete file
7 BLK FORM 0.1 Z X-117.7002 Y-143.8295 Z-0.025
8 BLK FORM 0.2 X+282.2998 Y+143.1705 Z+0.025
9 :
10 : SEL_BLK_FORM from selection
11 BLK FORM 0.1 Z X+8.5698 Y-34.4975 Z-0.025
12 BLK FORM 0.2 X+19 Y+0 Z+0.025
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14 L X+17 Y+0
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18 L X+14.5732 Y-11.6141
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25 END PGM CONT MM
```

```
TNC:\nc_prog\Interpolation\CONT.H BEGIN PGM CONT MM
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14 L X+17 Z+0
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16 C X+15 Z-2 DR+
17 L X+15 Z-4.3366
18 L X+14.5732 Z-11.6141
19 CC X+16.5698 Z-11.7312
20 C X+14.5698 Z-11.7312 DR+
21 L X+14.5698 Z-20.694
22 CC X+11.5698 Z-20.694
23 C X+13.3784 Z-23.0875 DR-
24 L X+10 Z-34.4975
25 END PGM CONT MM
```



Interpolation turning in combination with Cross Talk Compensation (CTC):

- In order to reach the cutting speed, program very high feed rates for interpolation turning



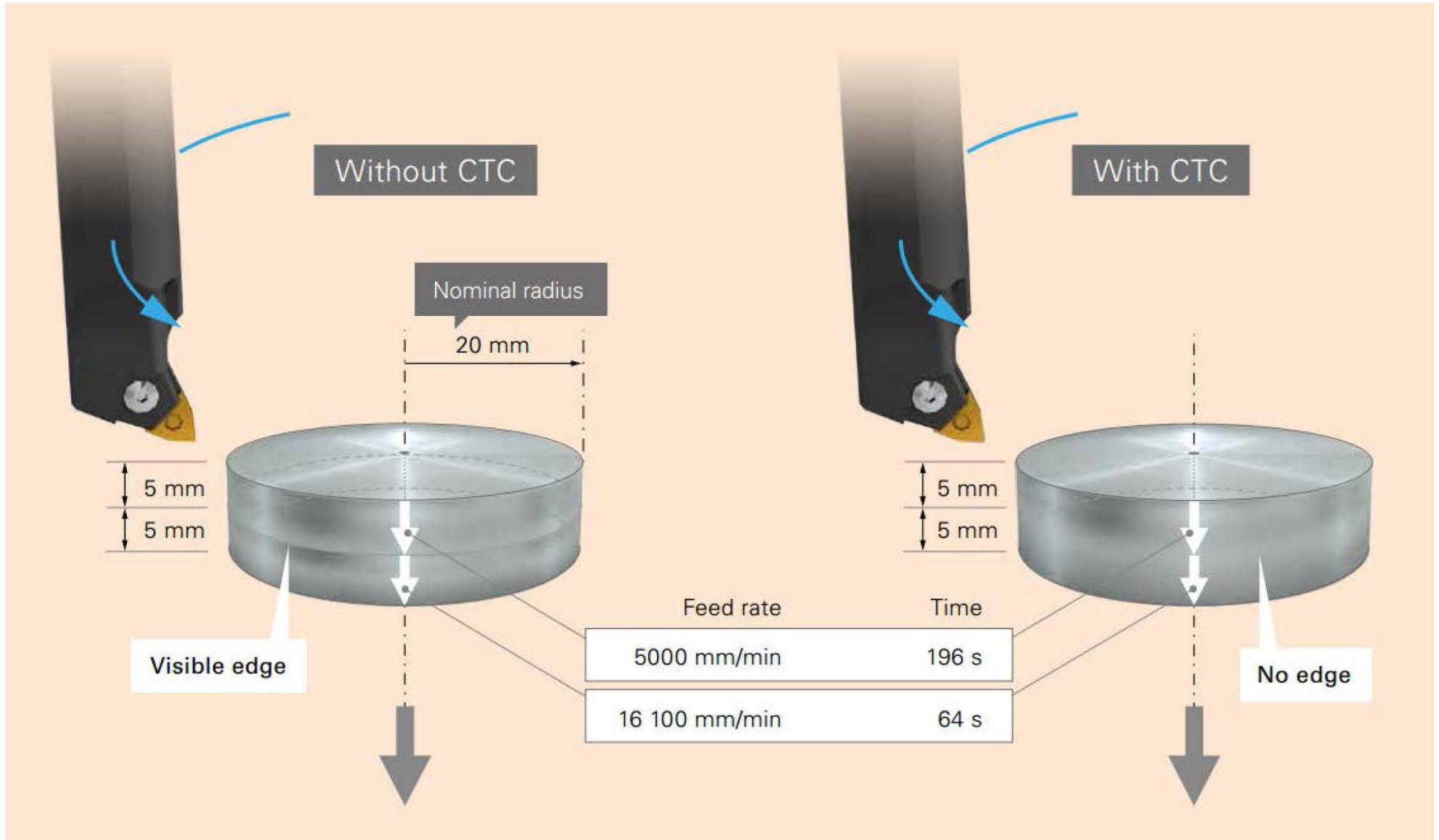
CTC OFF



CTC ON



Increasing the Machining Accuracy

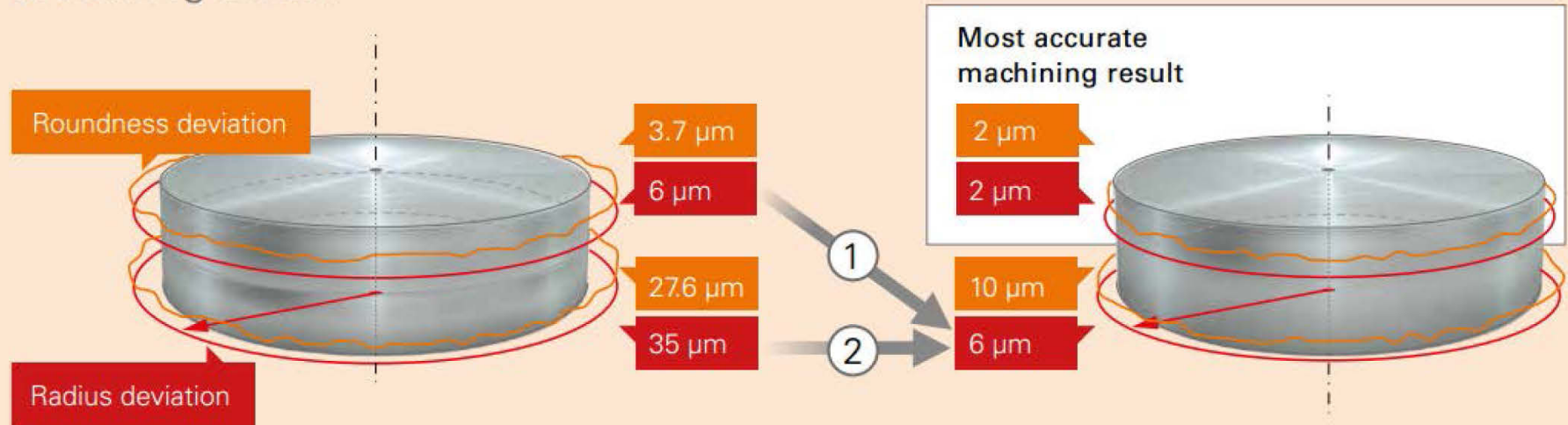




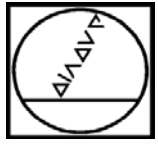
Increasing the Machining Accuracy

MW M-TS/ March 2017

Machining result:



- ① Faster with same accuracy of radius
- ② More accurate with same speed



Thank you very much for your attention!

Please do not hesitate to contact us should you have any questions:

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E-mail: 3103@heidenhain.de

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Thank you very much for your attention!

Michael Wiendl

