HEIDENHAIN

Webinar:

Working and Programming with CAD Import

Instructor: Michael Wiendl

Company: Dr. Johannes HEIDENHAIN GmbH
Position: Trainer for NC Programming

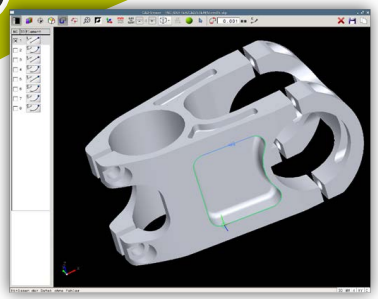
Overview

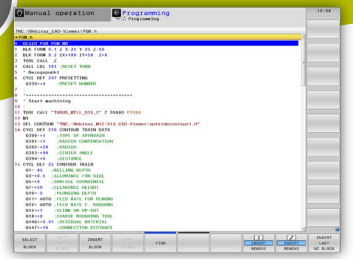
CAD import
- Fundamentals
- Specifying the workpiece preset
- Selecting the datum
- Selecting contours
- Selecting machining positions

Programming
- Open contour
- Closed contour
- Machining positions
- Datum shift and tilting the working plane

Tips and Tricks
- Navigation
- Contour transfer
- Path optimization
- TNC Club

CAD import





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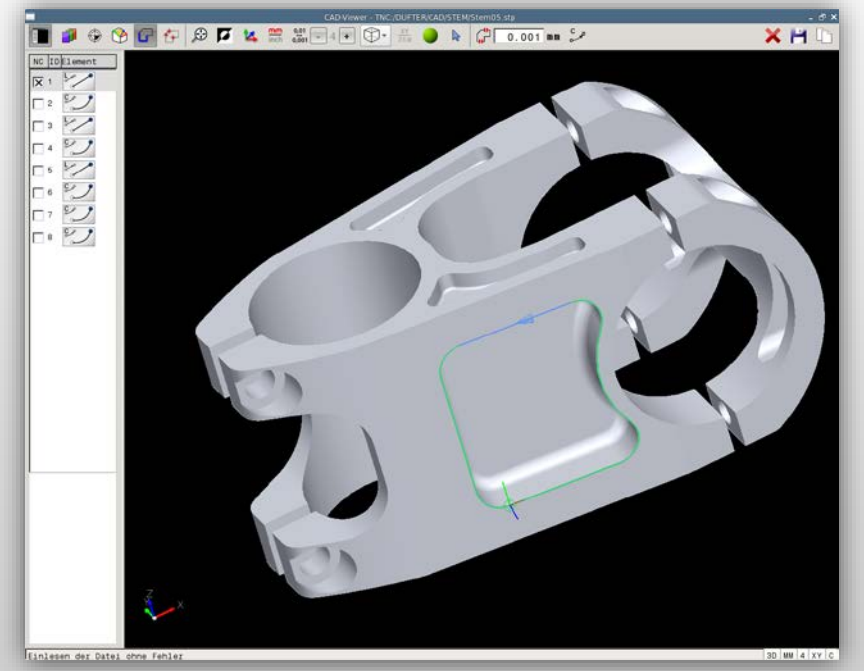
CAD Import

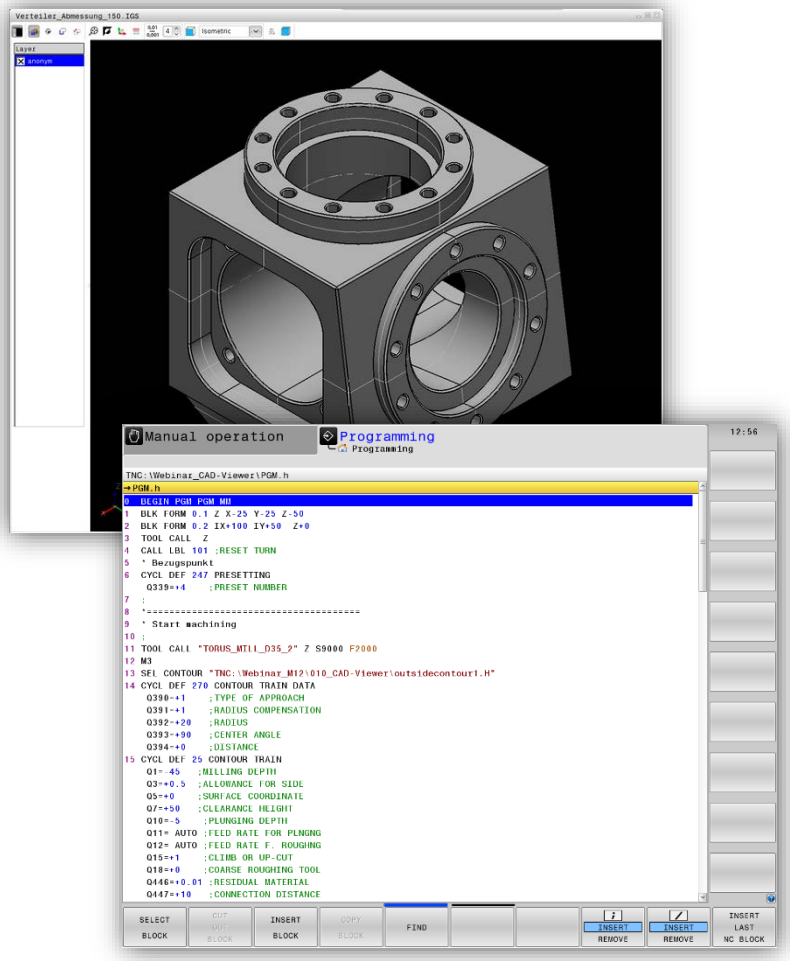


CAD viewer

- Standard (not an option)
- TNC 640 as of NC SW 34059x-05
- TNC 620 as of NC SW 81760x-02
- TNC 320 as of NC SW 771851-01

- Software option 98
- iTNC 530 as of 60642x-02/34049x-07

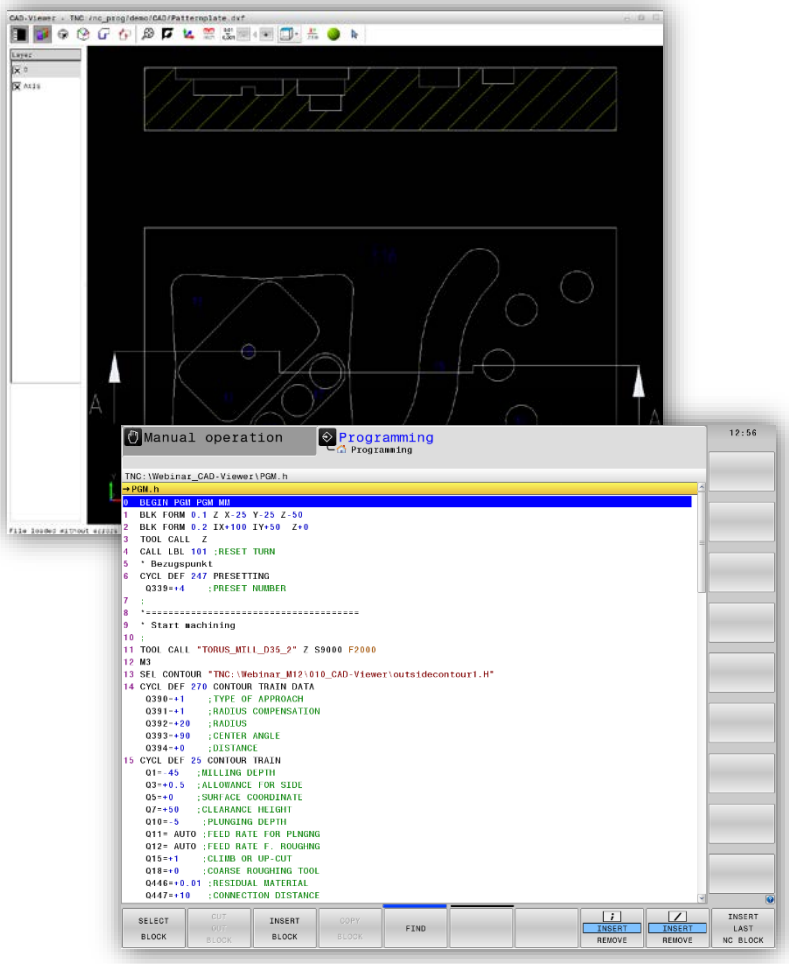
- Opening STEP, IGES, and DXF files
- Viewer for 3-D models
- Display of element information



DXF converter

- Software option 42
- TNC 640 as of NC SW 34059x-02
- TNC 620 as of NC SW 73498x-02/81760x-01
- TNC 320 as of NC SW 771851-01
- iTNC 530 as of 60642x-01/34049x-02

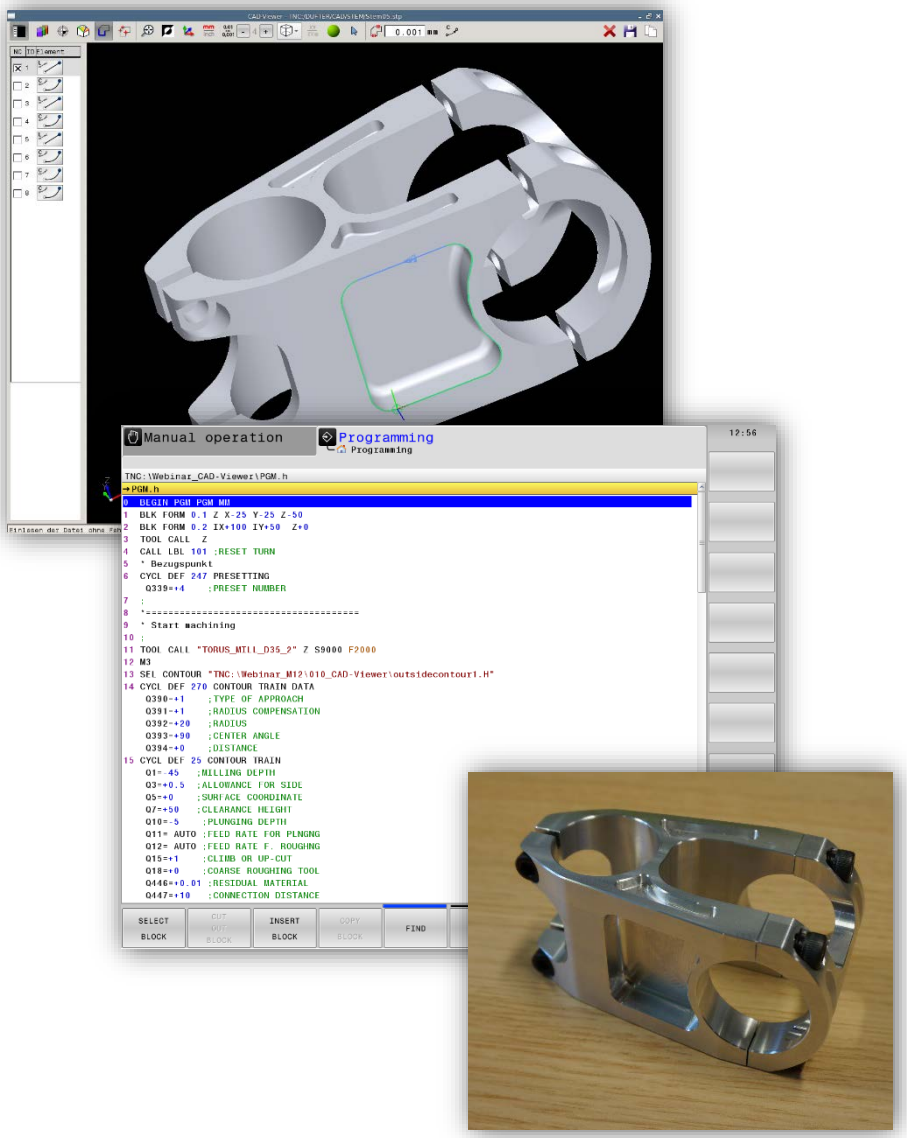
- Opening DXF files on the control
- Selecting machining positions and contours from the DXF file



CAD import

- Software option 42
- TNC 640 as of NC SW 34059x-08
- TNC 620 as of NC SW 81760x-05
- TNC 320 as of NC SW 77185x-05

- Opening of 3-D models (STEP/IGES) on the control
- Opening DXF files continues to be possible
- Defining the datum and the tilted working plane directly from the 3-D model
- Selecting machining positions and contours from the 3-D model



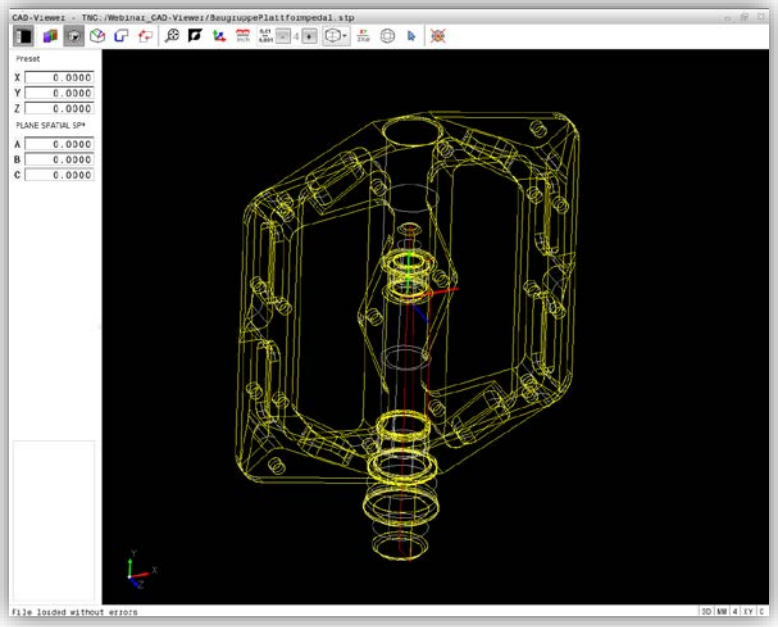
Preset

Specifying the workpiece preset

- The designer specifies the workpiece preset (position of the coordinate system) of the 3-D model in the CAD system
- The preset for machining and the preset of the design often do not correspond to each other

Procedure:

- Activate presetting 
- Adjust the preset by means of three points
  - The first point defines the origin of the coordinate system
  - The second point defines the positive X axis
  - The third point defines the positive Y axis



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Procedure:

- Activate presetting 
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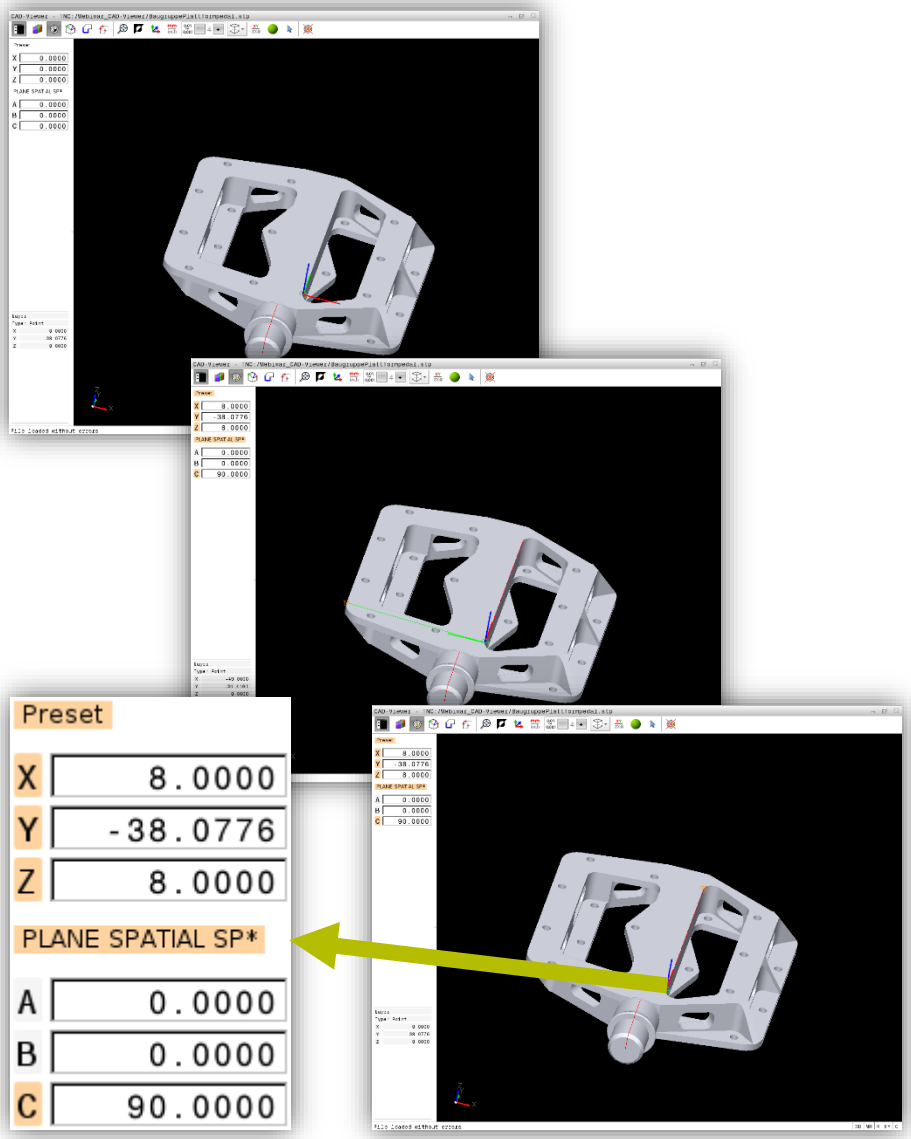
  - The third point defines the positive Y axis

Result:

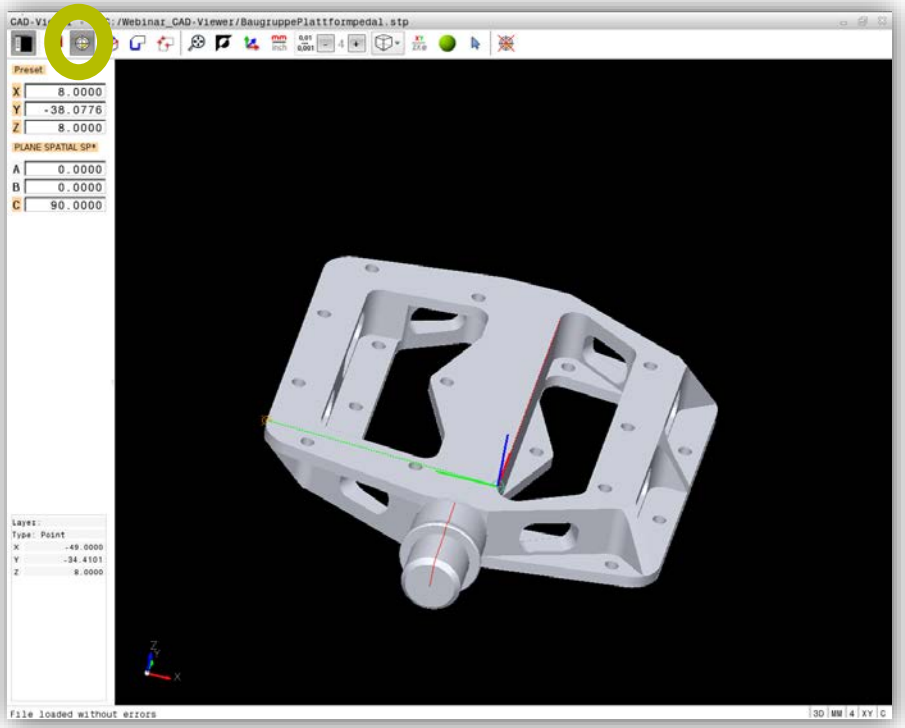
- The workpiece preset is set 
- All other actions refer to this preset

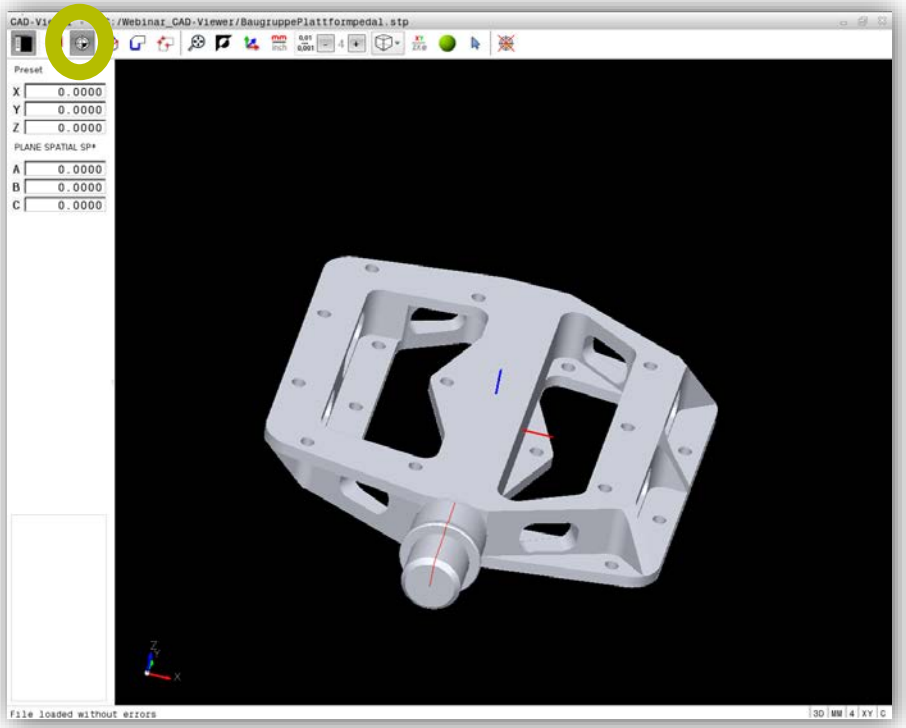


Preset

Deleting the preset / RESET

- Reset the preset with 





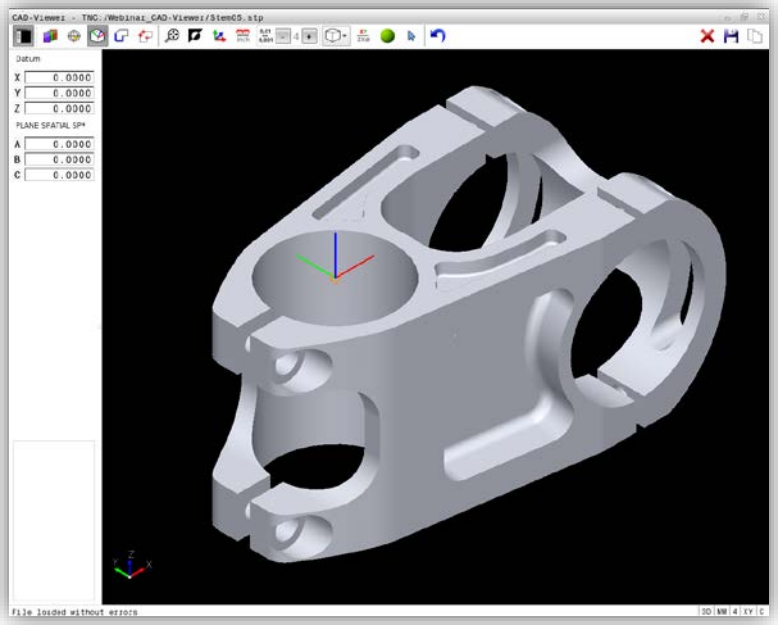
Datum and Tilting the Working Plane

Datum and tilting the working plane

- For machining, you now define the datum and, if required, also the angles for tilting the working plane

Procedure:

- Activate the datum 
- Adjust the preset by means of three points
  - The first point defines the origin of the coordinate system (datum)
  - The second point defines the positive X axis
  - The third point defines the positive Y axis



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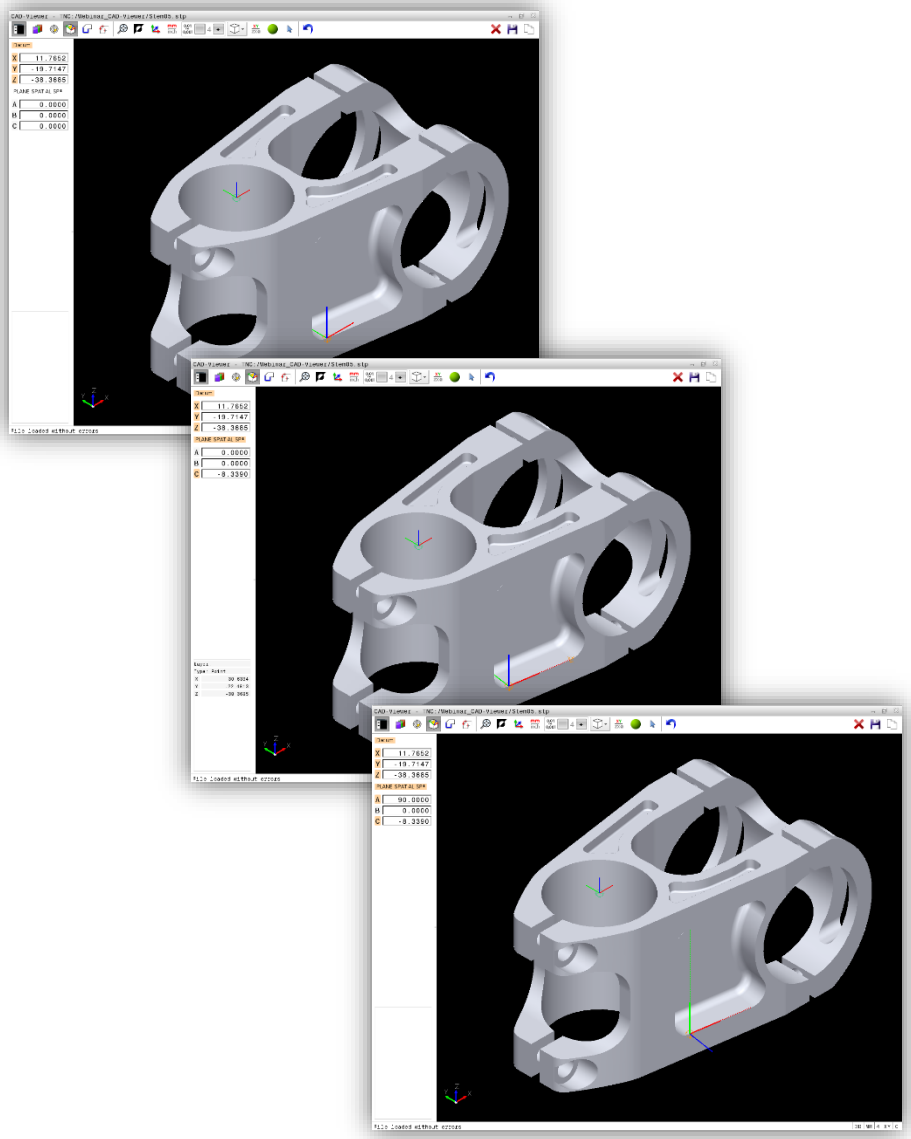
- For machining, you now define the datum and, if required, also the angles for tilting the working plane

Procedure:

- Activate the datum 
- Adjust the preset by means of three points
  - The first point defines the origin of the coordinate system (datum)
  - The second point defines the positive X axis
  - The third point defines the positive Y axis

Result:

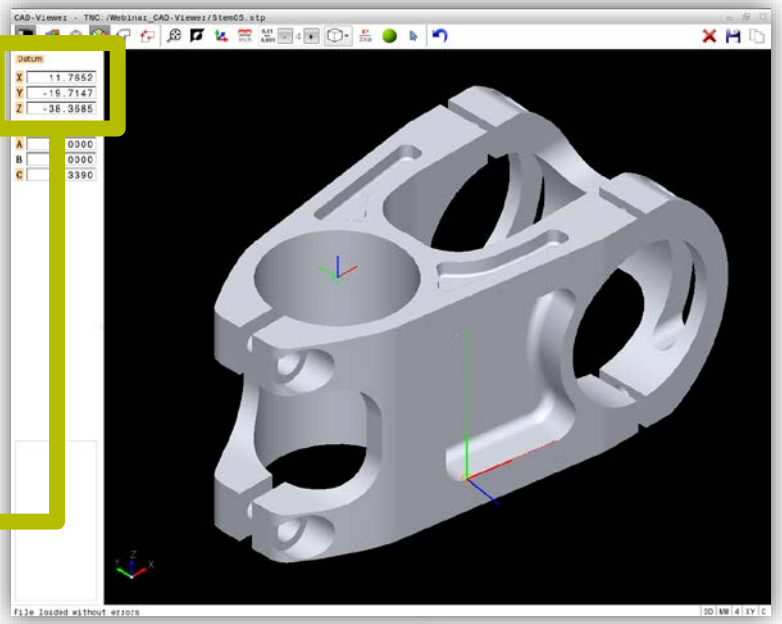
- The datum is set 
- Select contours or machining positions based on this datum



Datum and Tilting the Working Plane

Program output

- Save the datum shift and the tilted working plane in a Klartext conversational program.
- Copy the datum shift and the tilted working plane to the buffer memory. Insert them into the NC program with INSERT BLOCK.

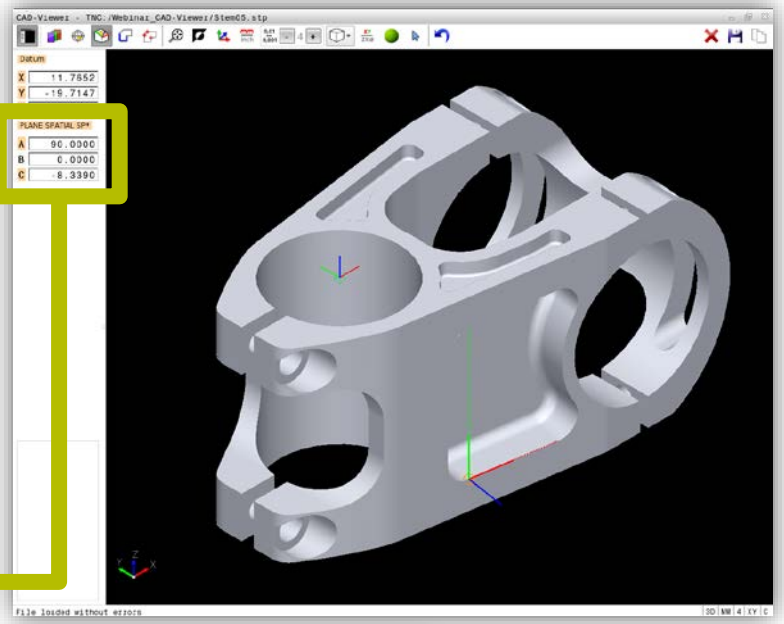



```
→TILT1.H
0  BEGIN PGM TILT1 MM
1  ;* origin_file = "Stem0 .stp"
2  ;* origin = X+0.0000 Y+ .0000 Z+22.5000
3  ;* origin_plane_spatia  SPA+0.0000 SPB+0.0000 SPC+0.0000
4  PLANE RESET STAY
5  TRANS DATUM AXIS  X+11.7652  Y-19.7147  Z-38.3685
6  PLANE SPATIAL SPA+90 SPB+0 SPC-8.339 TURN MB MAX FMAX
7  END PGM TILT1 MM
```

Datum and Tilting the Working Plane

Program output

- Save the datum shift and the tilted working plane in a Klartext conversational program.
- Copy the datum shift and the tilted working plane to the buffer memory. Insert them into the NC program with INSERT BLOCK.

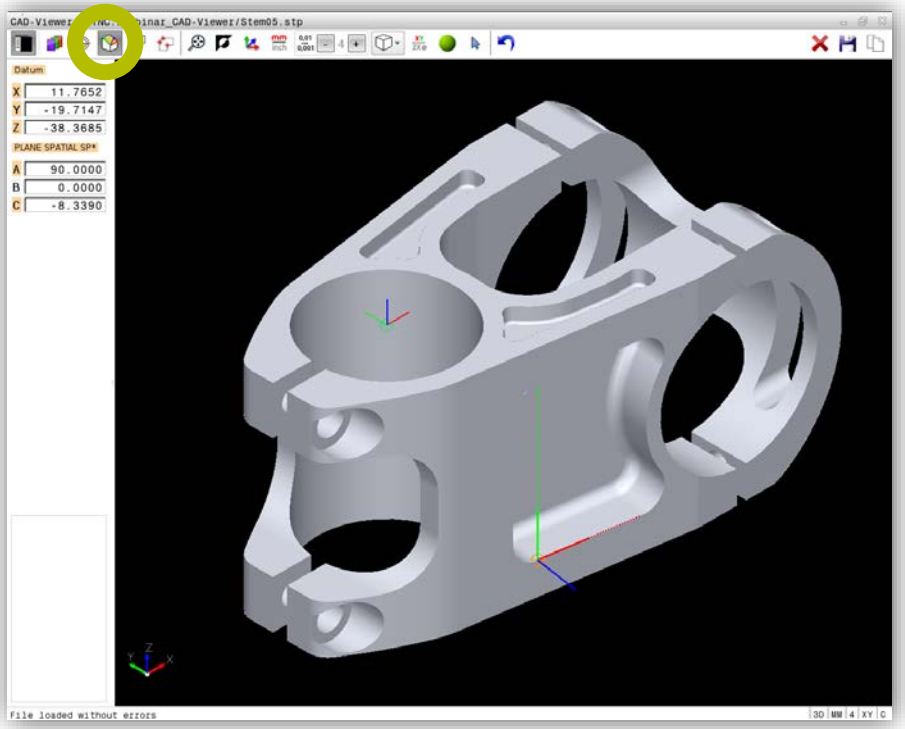


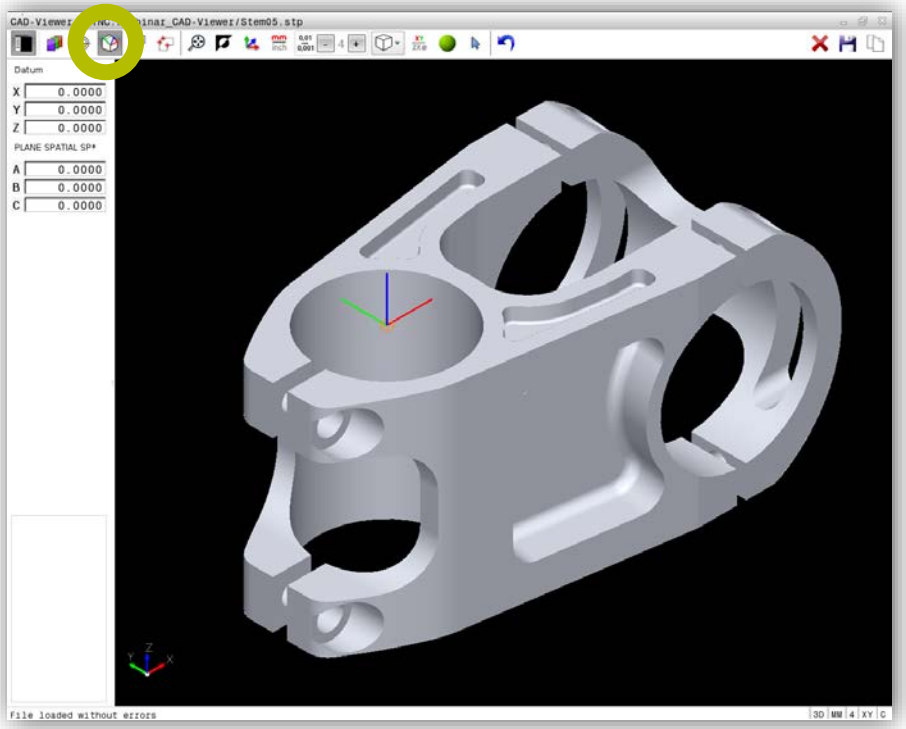

```
→TILT1.H
0  BEGIN PGM TILT1 MM
1  ;* origin_file = "Stem05.stp"
2  ;* origin = X+0.0000 Y+0.0000 Z+22.5000
3  ;* origin_plane_spatial = SPA+0.0000 SPB+0.0000 SPC+0.0000
4  PLANE RESET STAY
6  PLANE SPATIAL SPA+90 SPB+0 SPC-8.339 TURN MB MAX FMAX
```

Datum and Tilting the Working Plane

Deleting the datum and working plane tilt / RESET

- Reset your selection with 
- Undo the last step with 

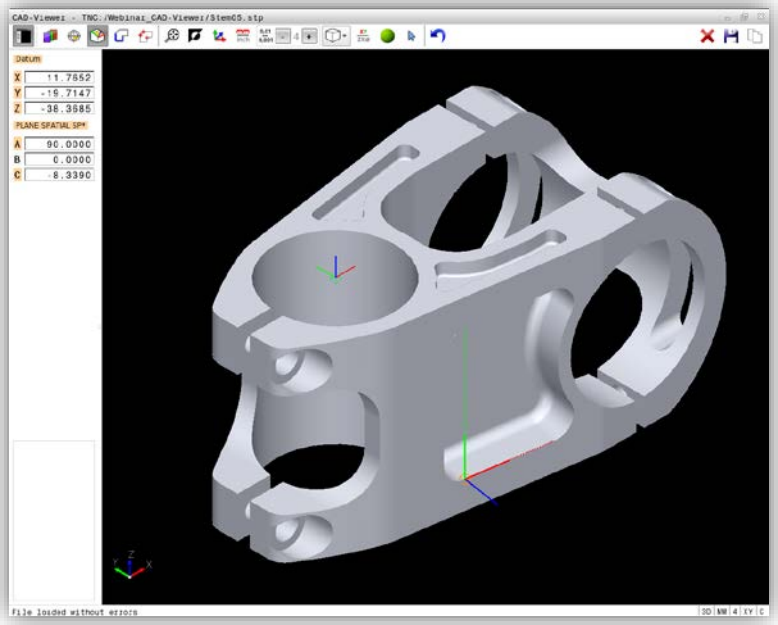




Contours

Selecting contours

- Transferring a continuous contour with two mouse clicks:
  - Click the first element (consider the direction → arrow)
  - Click the last element



Contours

Selecting contours

- Transferring a continuous contour with two mouse clicks:
  - Click the first element (consider the direction → arrow)
  - Click the last element

Procedure:

- Activate contour selection 
- Select a contour

Program output

- Save  the contour in a Klartext conversational program.
- Copy  the contour to the buffer memory. Insert it into the NC program with INSERT BLOCK.

Contours

Selecting contours

- Transferring a continuous contour with two mouse clicks:
  - Click the first element (consider the direction → arrow)
  - Click the last element

Procedure:

- Activate contour selection 
- Select a contour

Program output

- Save  the contour in a Klartext conversational program.
- Copy  the contour to the buffer memory. Insert it into the NC program with INSERT BLOCK.

→CONTOUR1.H

```
0  BEGIN PGM CONTOUR1 MM
1  * 8 contours
2  ;* origin_file = "Stem05.stp"
3  ; FUNCTION MODE MILL
4  ;* origin = X+0.0000 Y+0.0000 Z+22.5000
5  ;* origin_plane_spatial = SPA+0.0000 SPB+0.0000 SPC+0.0000
6  ; PLANE RESET STAY
7  ; TRANS DATUM AXIS X+11.7652 Y-19.7147 Z-38.3685
8  ; PLANE SPATIAL SPA+90.0000 SPB+0.0000 SPC-8.3390 TURN MB MAX FMAX
9  ; 1 + 3 line(s) + 5 arc(s) + 0 gap-filler(s), minimum arc radius = +4.2500
10 ; all_blk_form from complete file
11 BLK FORM 0.1 Z X-22.223 Y-24 Z-22.5
12 BLK FORM 0.2  X+70.9  Y+24  Z+22.5
13 ; sel_blk_form from selection
14 BLK FORM 0.1 Z X-4.5 Y-42.648 Z-11.6185
15 BLK FORM 0.2  X+66.3317  Y+31.737  Z+11.6185
16 L  X+0  Y+0  Z+0
17 L  X+19.0759  Y+0  Z+0
18 CC  X+19.0759  Y+4.25
19 C  X+22.6687  Y+6.5203 DR+
20 CC  X+37.4627  Y+15.8685
21 C  X+22.6687  Y+25.2168 DR-
22 CC  X+19.0759  Y+27.487
23 C  X+19.0759  Y+31.737 DR+
24 L  X+0  Y+31.737  Z+0
25 CC  X+0  Y+27.237
26 C  X-4.5  Y+27.237 DR+
27 L  X-4.5  Y+4.5  Z+0
28 CC  X+0  Y+4.5
29 C  X+0  Y+0 DR+
30 ;* end contours
31 END PGM CONTOUR1 MM
```

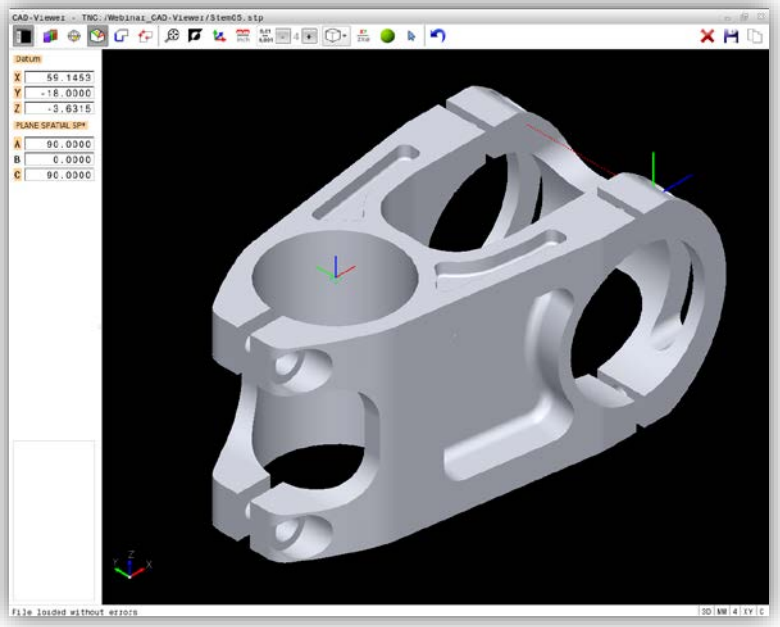
Selecting Machining Positions

Selecting machining positions

- Click the elements
- Sequence for clicking = machining sequence

Procedure:

- Activate position selection 
- Select positions



Selecting Machining Positions

Selecting machining positions

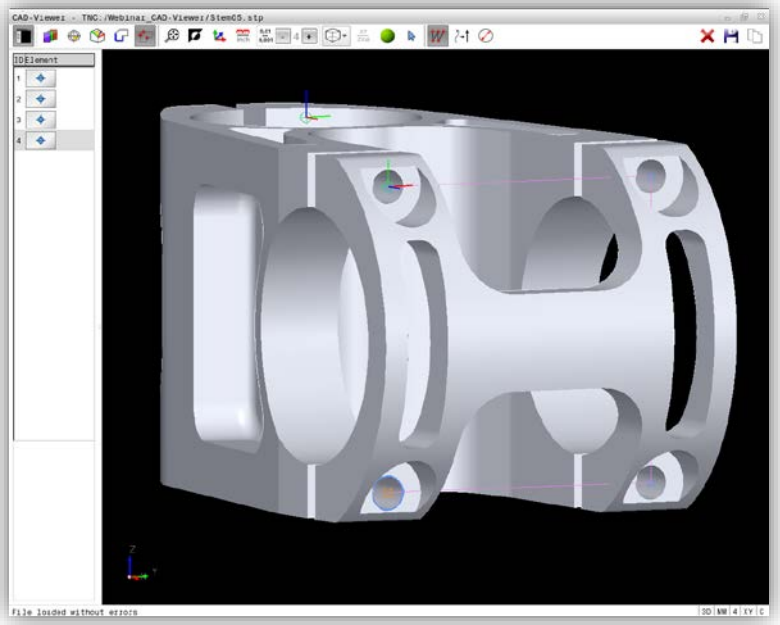
- Click the elements
- Sequence for clicking = machining sequence

Procedure:

- Activate position selection 
- Select positions

Program output

- Save  the positions in a point table.
- Copy  the positions to the buffer memory. Insert them into the NC program with INSERT BLOCK.



Selecting Machining Positions

Selecting machining positions

- Click the elements
- Sequence for clicking = machining sequence

Procedure:

- Activate position selection 
- Select positions

Program output

- Save  the positions in a point table
- Copy  the positions to the buffer memory. Insert them into the NC program with INSERT BLOCK.

NR	X	Y	Z	FADE	CLEARANCE
0	0.0000	-0.0000	0.0000	N	
1	36.0000	-0.0000	0.0000	N	
2	36.0000	-37.7370	0.0000	N	
3	0.0000	-37.7370	0.0000	N	

Point table .PNT

```
→CONTOUR1.H
36 ; PLANE RESET STAY
37 ; TRANS DATUM AXIS X+59.1453 Y-18.0000 Z-3.6315
38 ; PLANE SPATIAL SPA+90.0000 SPB+0.0000 SPC+90.0000 TURN MB MAX FMAX
39 ; BLK FORM 0.1 Z X+59.1203 Y-18.0000 Z-18.8685
40 ; BLK FORM 0.2   X+59.1703 Y+18.0000 Z+18.8685
41 L  X+0  Y+0  Z+0 FMAX M99
42 L  X+36  Y+0  Z+0 FMAX M99
43 L  X+36  Y-37.737  Z+0 FMAX M99
44 L  X+0  Y-37.737  Z+0 FMAX M99
45 ;* end positions
```

NC program .H

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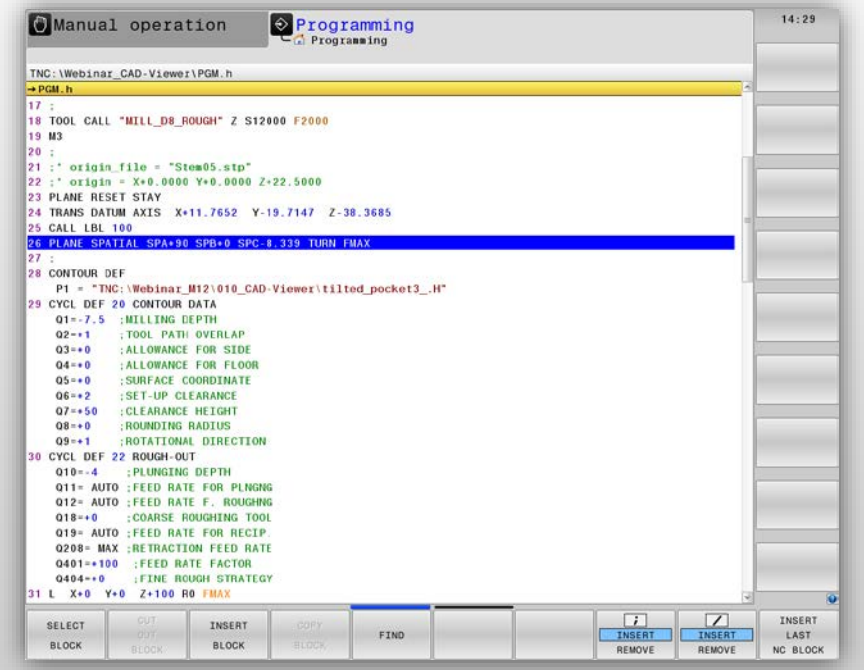
Programming

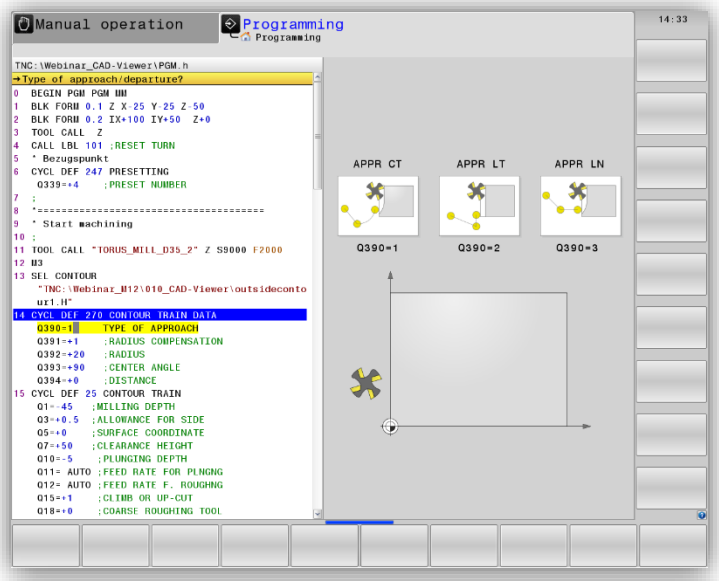


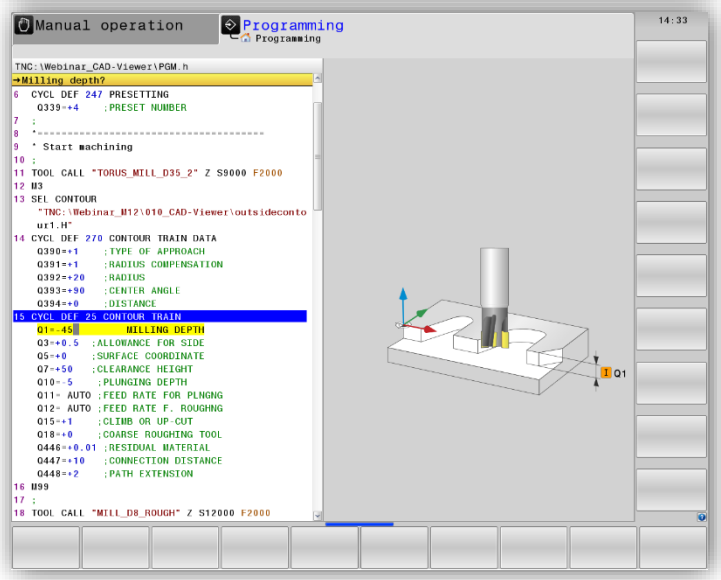
Open contour

- Integrating the contour into the NC program:
  - SEL CONTOUR with the path for contour description

  or
  - Cycle 14 with contour label

- Machining with
  - Cycle 25 with definition of
    - DEPTH
    - INFEED
    - Residual material can also be reworked, if required
  - Define the type of approach with Cycle 270





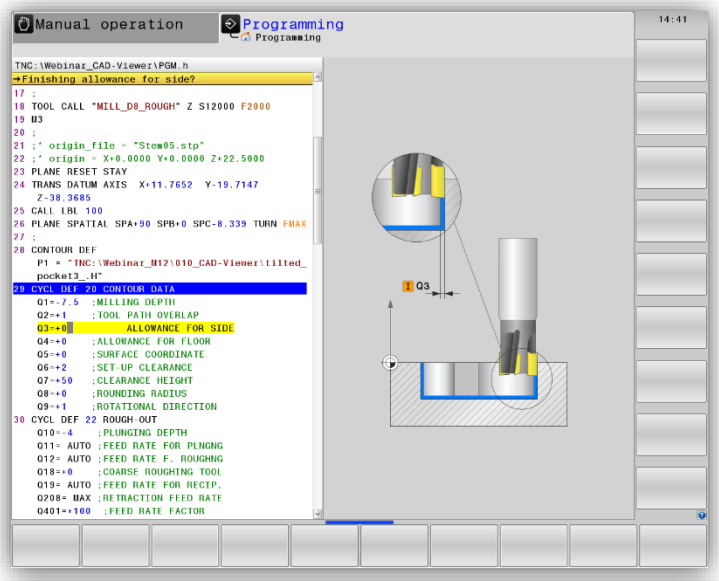
Closed contour

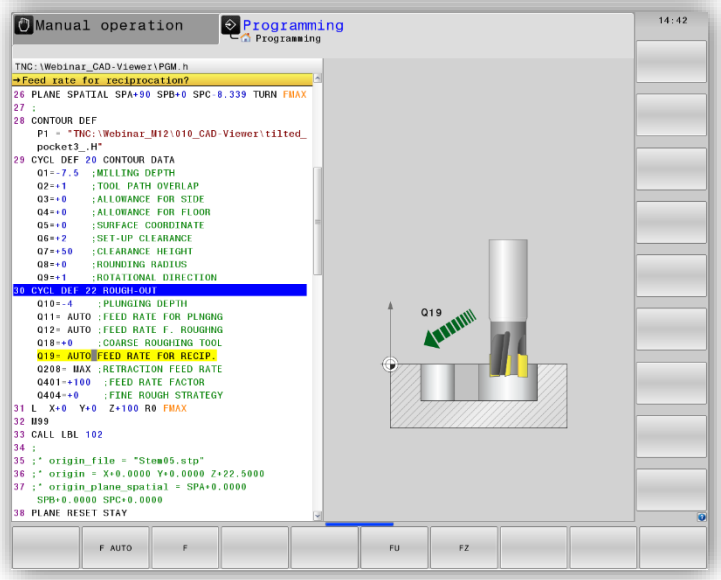
- Rough-out with SL cycles. Nesting of contours with
  - CONTOUR DEF with the path for contour description and definition of island/pocket (up to nine contours are possible)

  or
  - Cycle 14 with contour labels (up to twelve contours are possible)

  or
  - Complex contour formula (up to 128 contours are possible)

- Machining with
  - Cycle 20 (Contour data)
  - Cycle 21 (Pilot drilling, optional)
  - Cycle 22 (Roughing)
  - Cycle 23 (Floor finishing, optional)
  - Cycle 24 (Side finishing, optional)

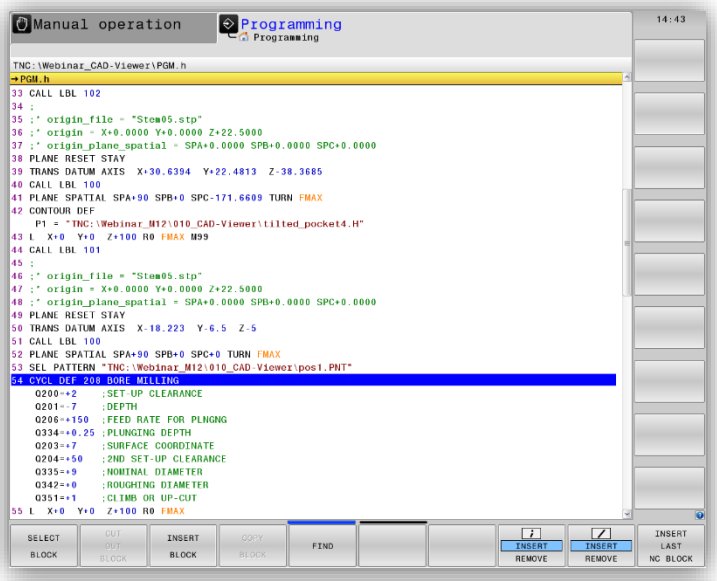


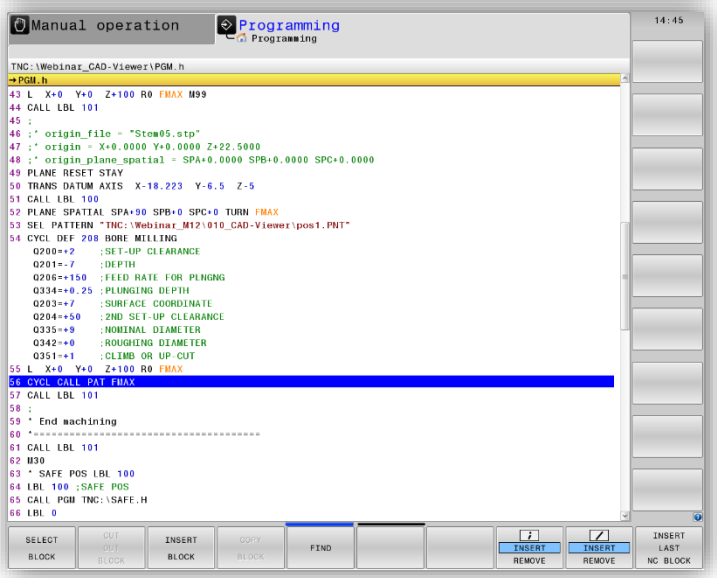


Machining positions

- Integrating the point table into the NC program with SEL PATTERN
- Machining with fixed cycles (e.g. Cycle 200)

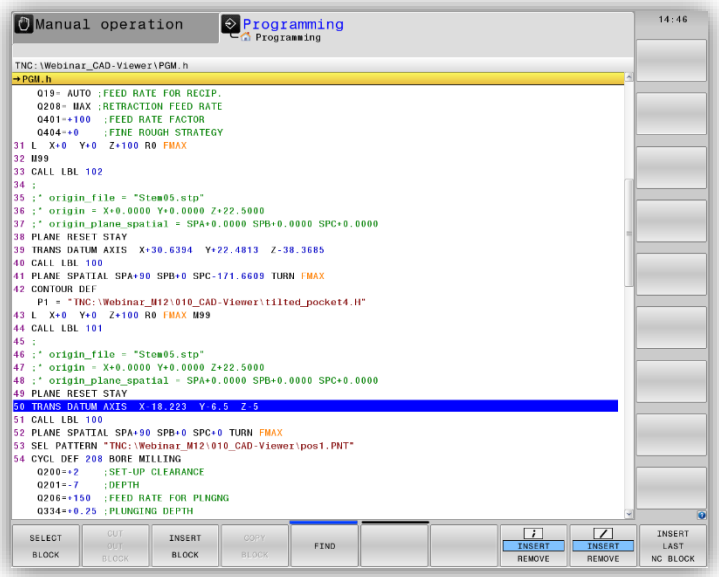
- Calling the programmed machining cycle at any position from the point table with CYCL CALL PAT





Datum shift and tilting the working plane

- Direct insertion into the NC program with INSERT BLOCK
  - PLANE RESET STAY
  - TRANS DATUM
  - PLANE SPATIAL (CAUTION, the default setting here is MB MAX; this may have to the adjusted)



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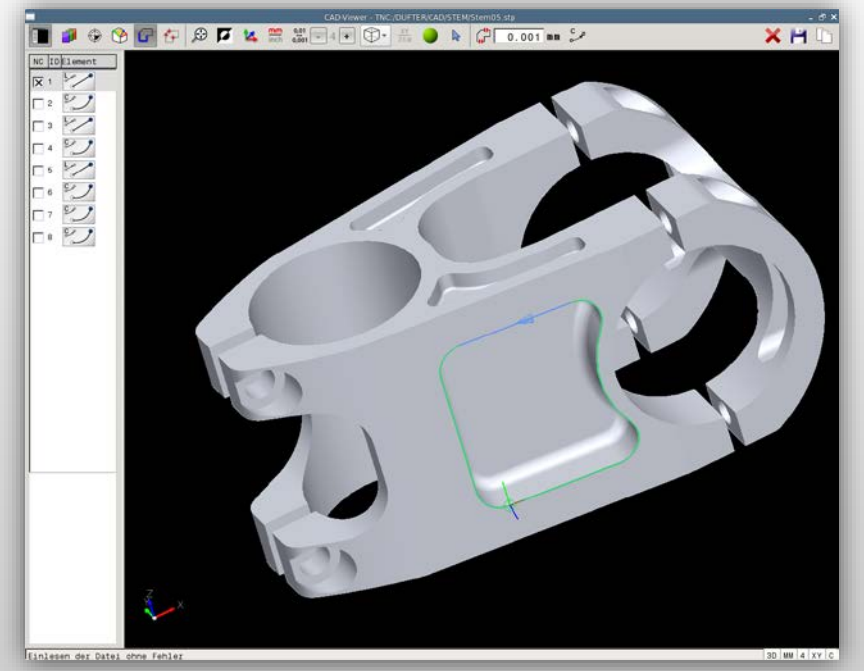
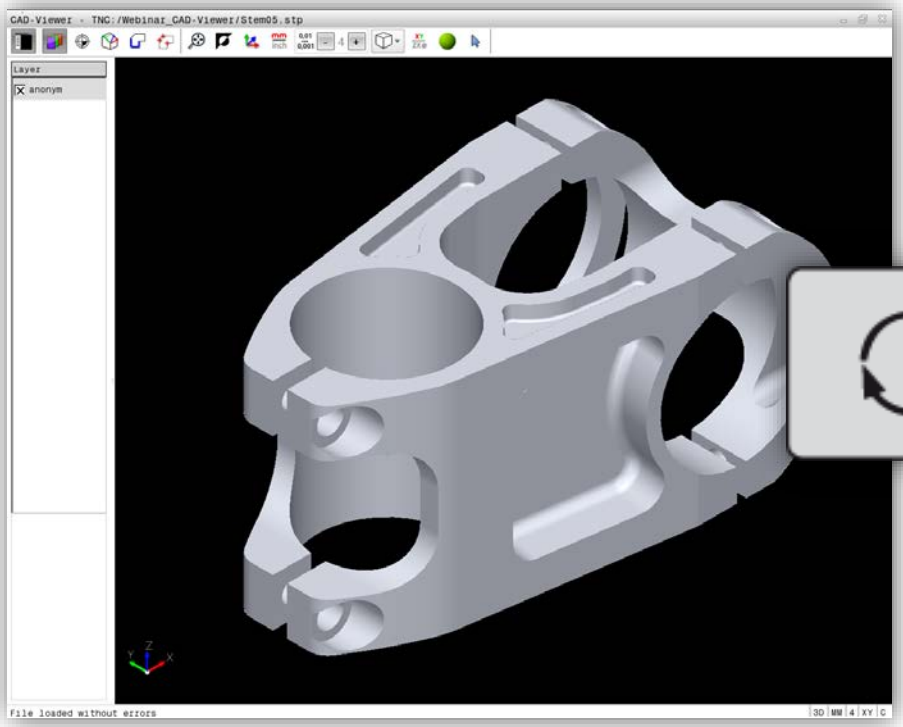
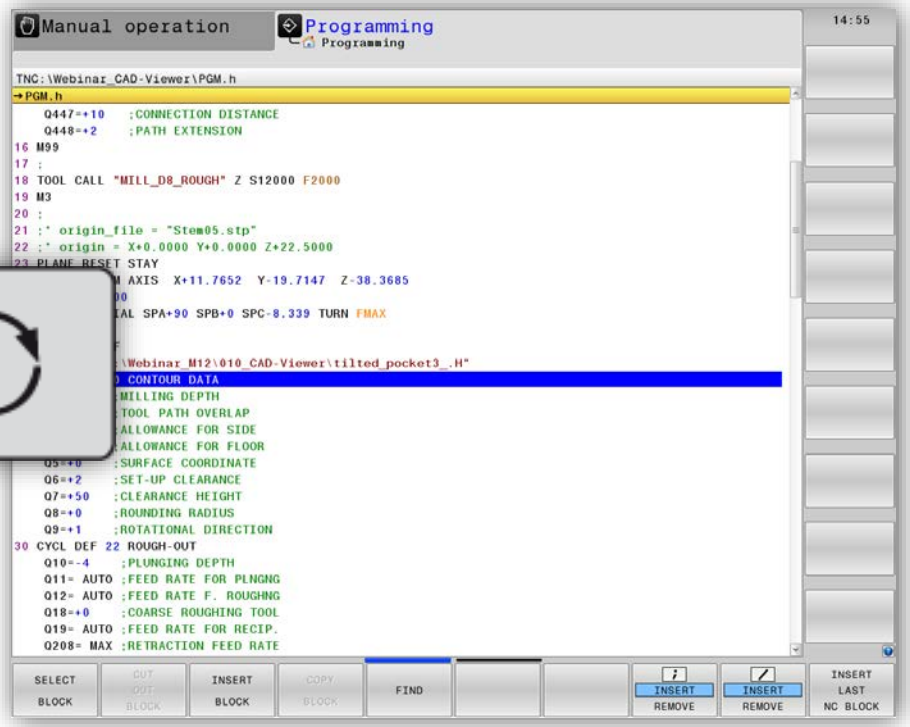
Tips and Tricks



Quick switchover between CAD import and programming

- Open CAD import on the third desktop, so that you can leave it open during programming
- Use the toggle key for fast switchover



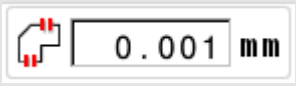


Tolerance for Contour Transfer

Available in contour transfer mode 

- Define the tolerance for how far neighboring elements should be from each other

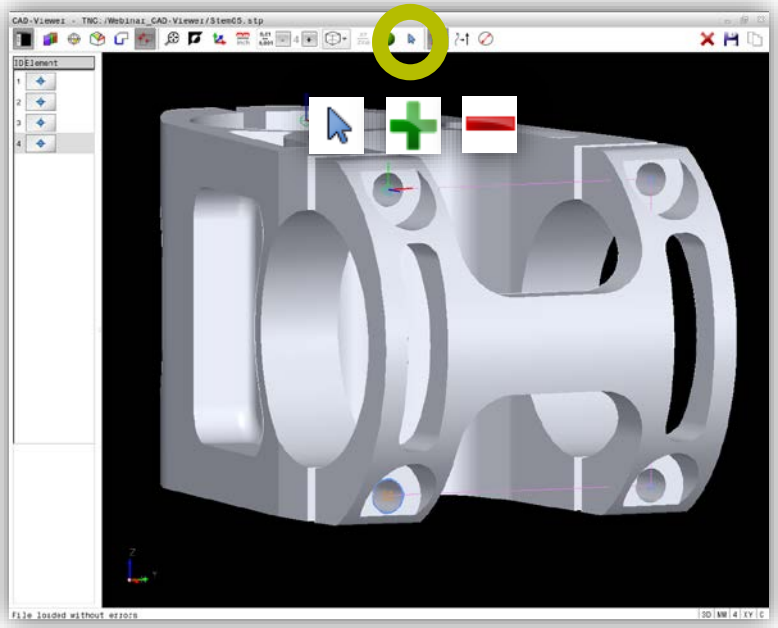
→ Compensating inaccuracy



Selecting and Deselecting

Selecting and deselecting

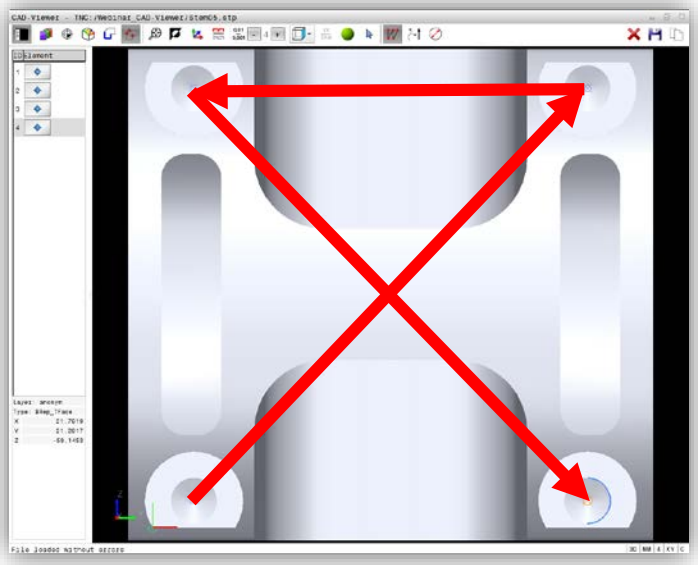
- Select elements with the mouse pointer 
- Display additional points with  (show start point, center point and end point)
- Deselect elements with 

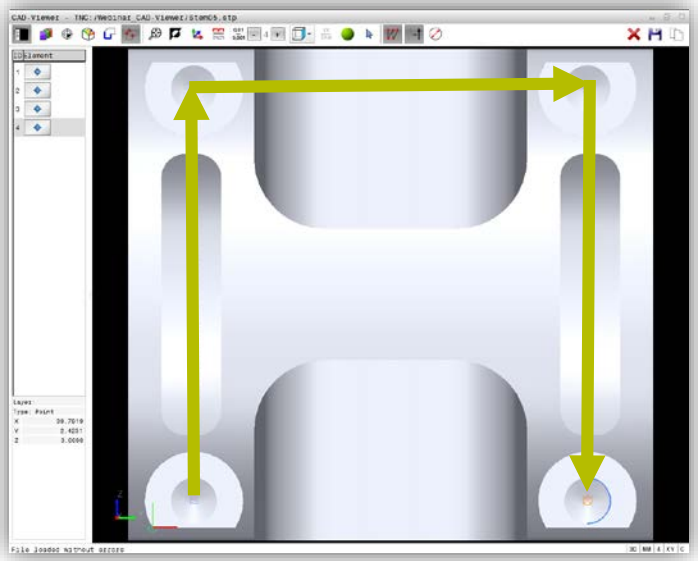


Path Optimization

Available only in point transfer mode

- Click the positions
- Sort the positions with the path optimization function 
- Clicking sequence shown in **RED**
- Positions after path optimization shown in **GREEN**





Program Output

Program output

- Set the program output with 
- Output with XYZ coordinates 
- Output with XY coordinates 

```
L   X+0   Y+0   Z+0
CC   X+0   Y+4.5
C   X-4.5   Y+4.5 DR-
L   X-4.5   Y+27.237   Z+0
CC   X+0   Y+27.237
C   X+0   Y+31.737 DR-
L   X+19.0759   Y+31.737   Z+0
CC   X+19.0759   Y+27.487
C   X+22.6687   Y+25.2168 DR-
CC   X+37.4627   Y+15.8685
C   X+22.6687   Y+6.5203 DR+
CC   X+19.0759   Y+4.25
C   X+19.0759   Y+0 DR-
L   X+0   Y+0   Z+0
```

```
L   X+0   Y+0
CC   X+0   Y+4.5
C   X-4.5   Y+4.5 DR-
L   X-4.5   Y+27.237
CC   X+0   Y+27.237
C   X+0   Y+31.737 DR-
L   X+19.0759   Y+31.737
CC   X+19.0759   Y+27.487
C   X+22.6687   Y+25.2168 DR-
CC   X+37.4627   Y+15.8685
C   X+22.6687   Y+6.5203 DR+
CC   X+19.0759   Y+4.25
C   X+19.0759   Y+0 DR-
L   X+0   Y+0
```

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Any questions?

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Thank you very much for your attention!

Michael Wiendl