PART 2

DigiPanel
for Emcomat 14D / 17D / 20D
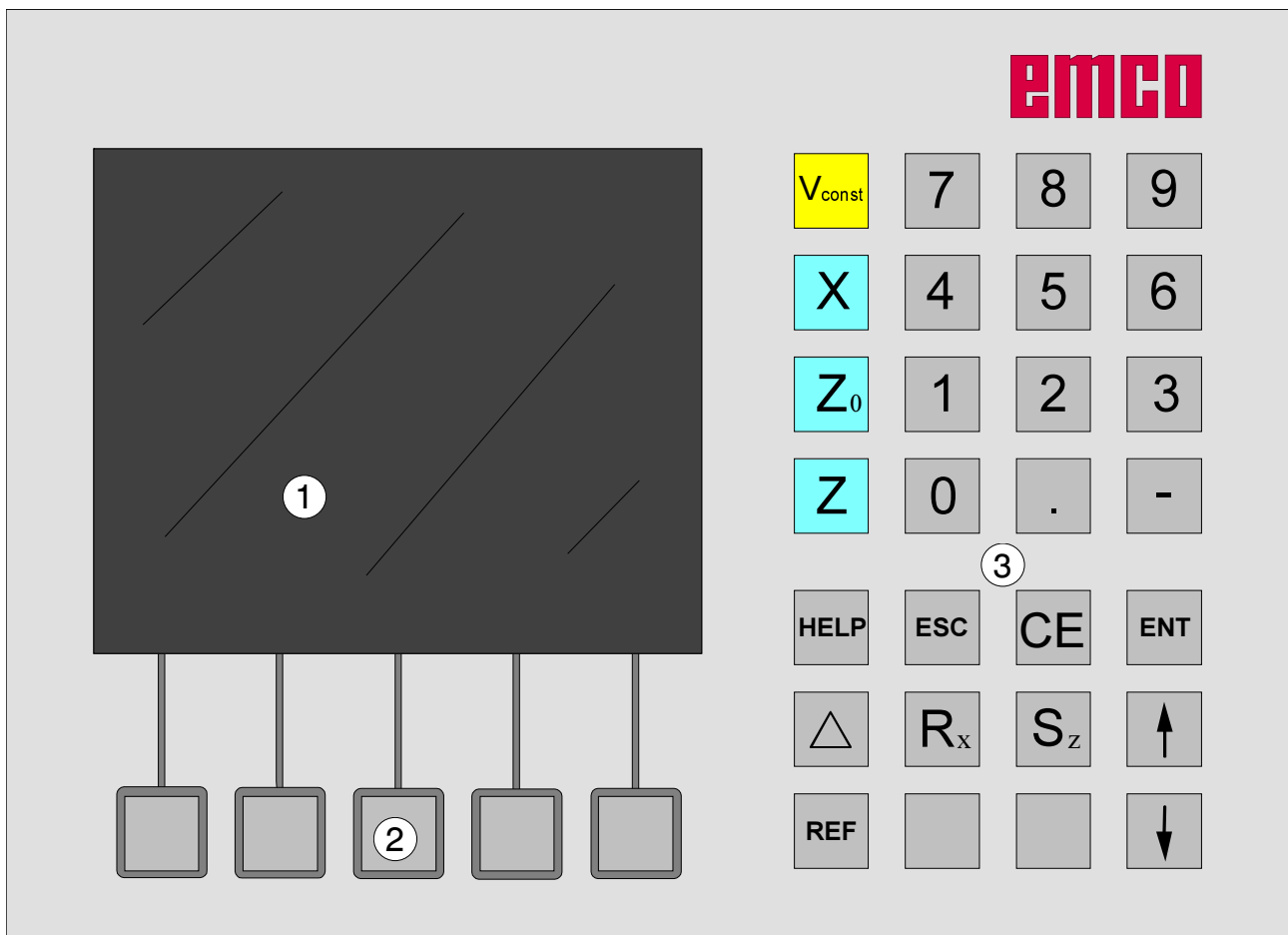
1 .... Screen (working window, displays)
2 .... 5 soft keys (function depends on the respective text shown on the screen)
3 .... Key block

C2008-08

Input box

Key block

Coordinate keys

By pressing one of the coordinate keys the position display of the axis is selected (path display shown with red frame). This axis is to be set via the key block (e.g. set to zero, enter a certain value, path to go - display).

Reference key

You enter the reference mode by pressing the reference key.

In this mode the reference labels are traversed.

In addition, tools and contour points can be entered. In the "system" area, diagnosis function and data import/export can be selected. When pressing the key again, the reference mode will be terminated.
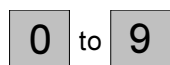
Numeric key block

Decimal key

Sign key

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Path to go - key

By pressing this key you switch over to the path to go - display (the symbol "△" appears).
The path to go - display is switched off by pressing the path to go - key twice (the symbol "△" disappears).
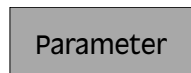
Soft key Parameter

With this key change-over into parameter input mode is carried out. In this mode standard selections such as display in [mm] or in [inch] or tool zero point active or inactive can be preselected.
After having entered the parameters, you leave the parameter input mode by pressing the soft key "Back".
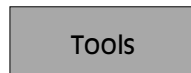
Soft key Tools

With this soft key you call the tool table. Tools can be measured (see "Tool measurement").
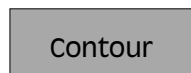
Soft key Contour

The contour table is called with this soft key. You can define contour points (see "Saving contour points").
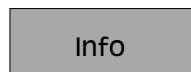
Soft key Info

The information page is called by means of this soft key. Data on software version, AC version, electrical documentation number and power supply are displayed.

Radius display key

By pressing this key switch-over to the radius display takes place, i.e. the X-value displayed is cut in two (the symbol "Ø" disappears).
By pressing again switch-over to diameter display takes place (the symbol "Ø" appears).
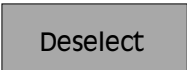
Correction key

With the correction key incorrect inputs, that have not been stored with the enter-key yet, can be corrected.

Soft key Select

Select

Tools and contour points can be selected by means of this key. A selected tool or a selected contour point is displayed in the top left-hand screen (see screen layout).

Soft key Deselect

Deselect

This soft key enables you to deselect already selected tools and contour points. In addition, you can leave the contour point mode with this key.

Sum key

S_z

By pressing the sum key the sum display of the axes Z_0 and Z is activated.
If the key is pressed again, the sum display is activated.

Input key

ENT

With this key changed data or data entered new via the key block are taken over and stored.

Escape key

ESC

This key enables you to reject changed or newly entered data via the key block.
An error message will be deleted.

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Screen layout

| T1 ① | P ?② | S ③ 10 rpm | ④ 13:18:14 |

Ø X ⑤ ⑥ — 25,60 mm

Z ₀ — 9948,69 mm → Z_0 — 9948,69 mm

Z — -9999 mm

⑦ Permissible value range: -10000 to 10000

| Parameter | Tools | Datum point | Contour ⑧ | Info |

Note:
The symbol "?" means that no tool or contour point has been selected.

Note:
Nominal values are displayed on a yellow background.
Actual values are displayed on a cyan background.

1 Number of the selected tool
2 Number of the selected contour point
3 Spindle speed display / cutting speed
4 Time / gear step
5 Path display
6 Symbols for display modes: "Ø" diameter display, "Σ" sum display, "Δ" path to go - display
7 Alarm and message line
8 Soft-key row; soft keys are selected by means of the keys being positioned below.

Coordinate system

Coordinate system of path-measuring display
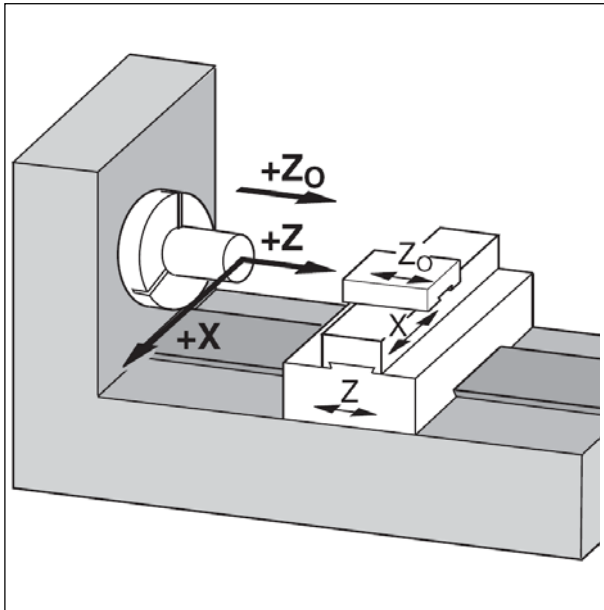
Three axis are integrated in the path-measuring system:

Cross slide: X-axis
Upper slide: Zo-axis
Longitudinal slide: Z-axis

The origin of the coordinate system (0-point) is to be found in the machine zero point.

Note:
If turning work is carried out only cross-wise and in parallel to the rotary axis (no taper turning) it is useful to switch on the sum display. Thus, approaching certain points is facilitated since only one Z-axis is to be taken into account.
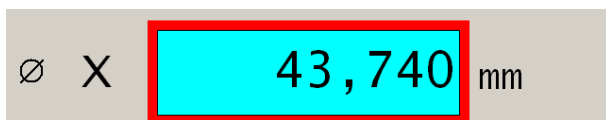
Path display

In the path displays the position of the tool or of a certain point on the upper slide with respect to a reference point can be read.
A red framing of the path display shows which of the three axes is currently active. Active means which position display of the respective axis can be set (e.g. setting to zero, enter a certain measurement, path to go - display).

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⚠️

Caution:
All protected parameters marked with "Key" should only be changed with the greatest care, so as to avoid erors within the measurement system.

Start-Up	Control	Settings

Parameter

T ?	P ?	Parameter	06/17/13

No.	Description:	Value:	Edit:
7	Contour diameter	1	Yes
8	Datum pt/zero offset	0	Yes
9	Display	3	Yes
10	Show RPM	1	Key
11	Res. spindle speed	1	Yes
12	X-Display active	1	Yes
13	Z0-Display active	1	Yes
14	Z-Display active	1	Yes
15	Digital readout only	0	Yes

1...activation, 0...deactivation of digital readout for Z

Go to	Edit	Start-Up	Settings	Back

T ?	P ?	Parameter	14:25:51

Key entry:

3141

Enter key for parameter change

			Apply	Back

Back

Parameters of the path-measuring system

In parameter input mode certain default settings can be carried out which are permanently effective after machine switch-on. 3 groups of parameters are distinguished:
• settings for initial operation
• settings for operating surfaces
• machine parameters
There are protected parameters as well as ones being not protected. In case you want to change a protected parameter, you have to enter a password for the parameter change.

Changing parameters

1. Call the parameter table (press the soft key "Parameter")

2. Select the parameter number by means of the cursor keys or the soft key "Go to". The function of the parameter is explained in the alarm and message line.

3. Press the soft key "Key". In case only the soft key "Edit" appears, press this key and continue with point 5.

4. Enter the password for the parameter change. The key reads: 3141!
Confirm with the soft key "Apply" or the enter-key. Incorrect entries can be corrected by means of the "CE" key, before pressing the enter-key.

5. The selection possibilities for alterations are displayed in the alarm and message line. Save changes with the soft key "Apply". Incorrect entries can be corrected by means of the "CE" key, before pressing the enter-key.

6. After having changed a parameter, the machine has to be started again.

7. Quit the parameter table by pressing the soft key "Back" or the ESC key.

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Display modes

Radius and diameter display

∅ X **40,000** mm
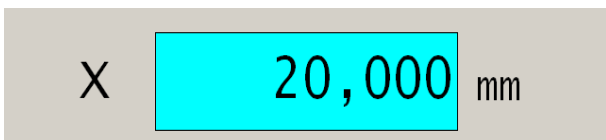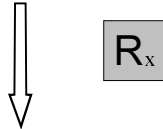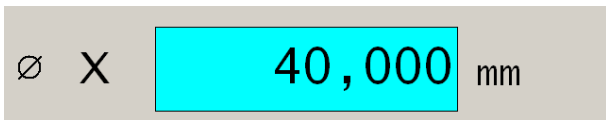
The measuring electronic system facilitates switch-over from diameter display (switch-on state) to radius display.

R_x

By pressing the "Rx" key switch-over to radius display takes place and the X-value is cut in two (the diameter symbol "∅" disappears).

X **20,000** mm

By pressing the "Rx" key again switch-over to diameter display takes place (the diameter symbol "∅" appears).
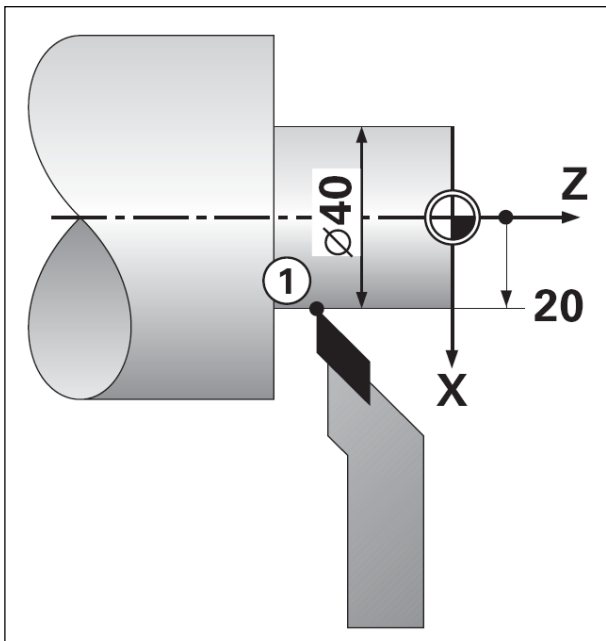
Example:
Radius display position ①   X=20mm
Diameter display position ① ∅   X=40mm

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Sum display

Z_0 15,000 mm

Z 25,000 mm

S_z

Σ Z 40,000 mm
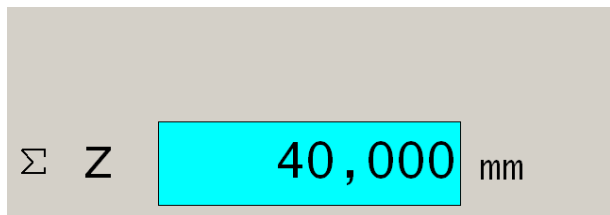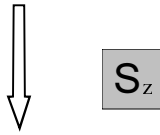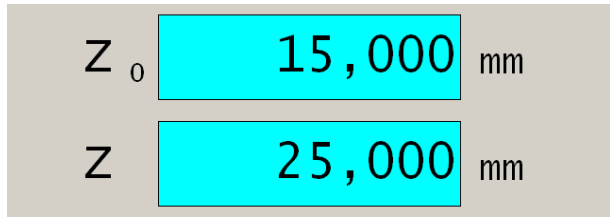
With sum display the values indicated for the Z_0-axis and for the Z -axis are added and indicated in the display for the Z-axis.
The sum display shows the absolute position of the tool, related to the workpiece zero point.
The Z_0-axis is switched off. The symbol "Σ" appears when the sum display is active.

The sum display is switched on with the sum key (the symbol "Σ" appears, the path display Z_0 is switched off) and, when pressed again, switched off again (the symbol "Σ" disappears, the path display Z_0 is switched on).
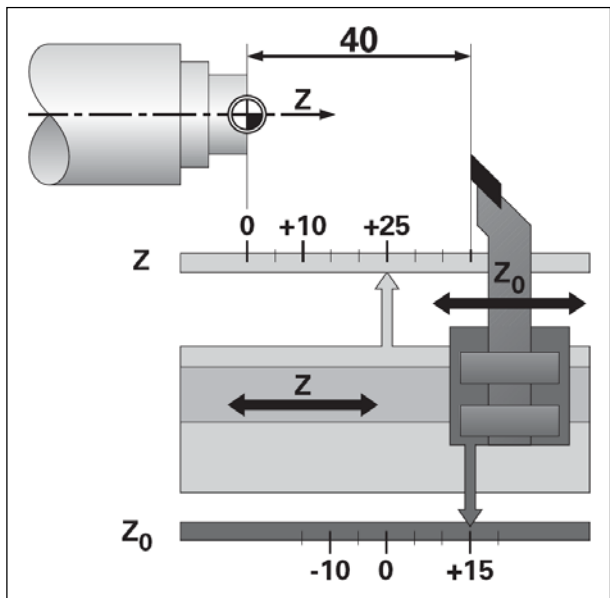
Example:
Single display   Z=25mm
                                    Z_0=15mm
Sum display Σ Z=40mm
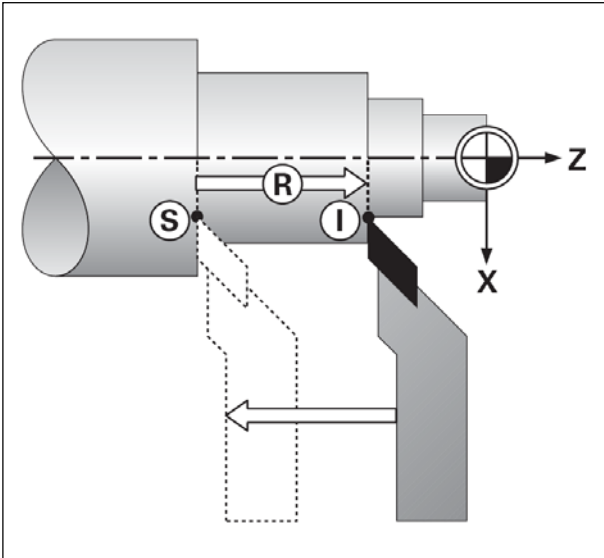
Path to go - display

The target position is the position where the tool has to be moved to; the actual position is the position where the tool currently is.
The path between the target and the actual position is the path to go.

Often, it is sufficient when the coordinates of the actual position of the tool are displayed. Most of the time it is better to display the path to go. You may easily position by moving to the display value zero.

Arithmetic sign of the path to go
The path to go has a positive arithmetic sign if you move from the actual to the target position in negative axis direction.
The path to go has a negative arithmetic sign if you move from the actual to the target position in positive axis direction.
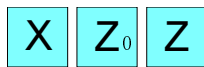
Operation of the path to go - display

1. The required axis is activated by pressing the respective axis key (the selected axis has a red frame).

2. Press the path to go - key.

3. Enter the target position.
   Corrections can be carried out by means of the "CE" key.

4. Confirm the entry.

In the axis displays the remaining paths to go, that have to be traversed, are displayed on a yellow background with the symbol Δ. The path displays, where no target position has been entered, show the current actual position on a blue background.

| T ? | P ? | S | 0 | rpm | 13:23:35 |

$\varnothing$ X	26,24	mm
Z $_0$	8,75	mm
$\triangle$ Z	−11,25	mm

| Parameter | Tools | | Contour | Info |
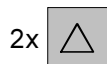
The path to go - display is switched off by pressing the path to go - key twice (the required axis has to be selected).

2x

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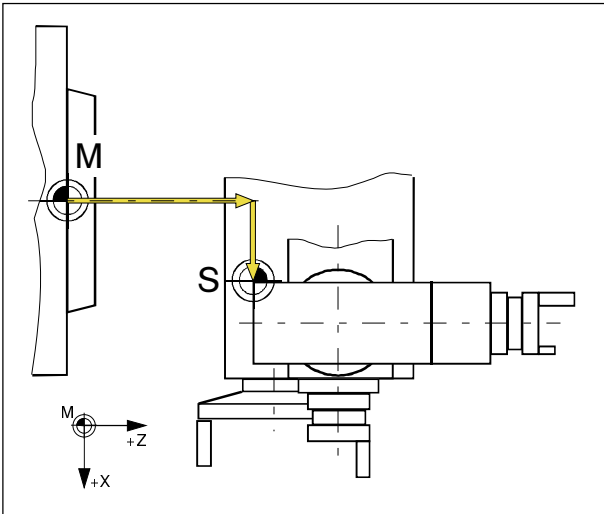
Machin zero point   *M*
Slide reference point   *S*

Machine points

Machine zero point M ⊕

The machine zero point M is a fixed point on the machine.

In this point the origin of the coordinate system is to be found.

The machine zero point is exactly on the front side of the spindle nose in the rotating axis.

Slide reference point S ⊕

The slide reference point S is to be found exactly on the left rear corner point of the upper slide.

If the reference labels are activated after the machine has been switched on, the path display shows the position of the slide reference point S towards the machine zero point M.

Workpiece zero point W ⊕

The workpiece zero point can be defined as required.

The workpiece zero point W is used in the measurement of tools as zero point with respect to which the tools are measured.

When displacing the workpiece zero point the measured tools are also displaced.

Preferably the workpiece zero W is exactly placed in the rotating axis at the front side of the workpiece (define reference point / zero offset NPV).

Tool point N ⊕

The tool point N can be stored as you like for each tool.

The path display shows with measured tools the position of the tool point N (tool tip) to the workpiece zero point W.

The tool point N can only be stored in reference mode (see measurement of tools).

A maximum of 999 tools can be stored (standard setting 99 tools; can be set by means of the parameter "tools").

Contour point P ⊕

The contour point K is a point which can be freely selected and stored. It is used to be able to find certain points of a workpiece, e.g. when manufacturing a number of similar workpieces.

A maximum of 999 contour points can be stored (standard setting 99 contour points; can be set with the parameter "contour points").
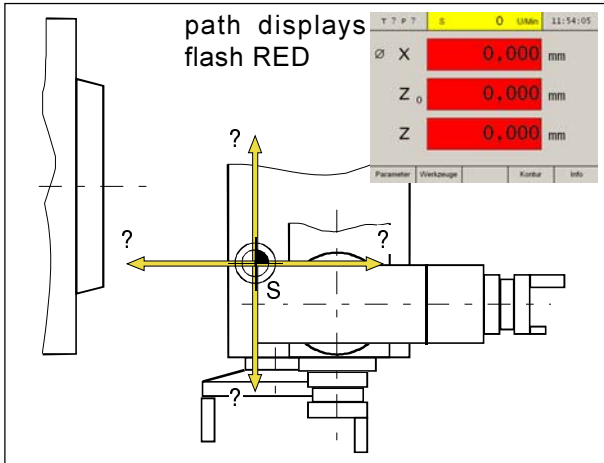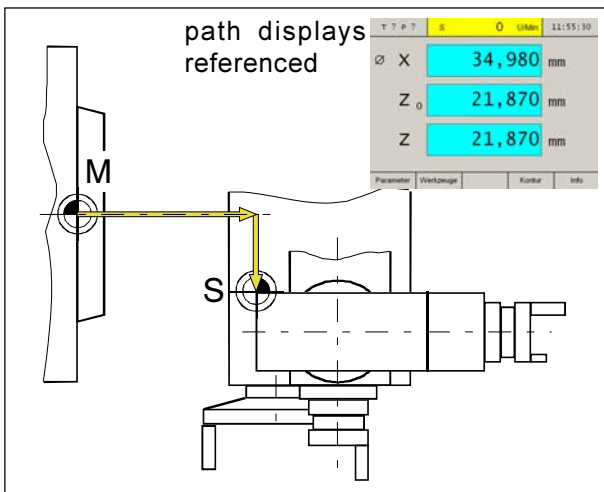
Machine zero point   *M*
Workpiece zero point   *W*
Tool point   *N*
Contour point   *P*
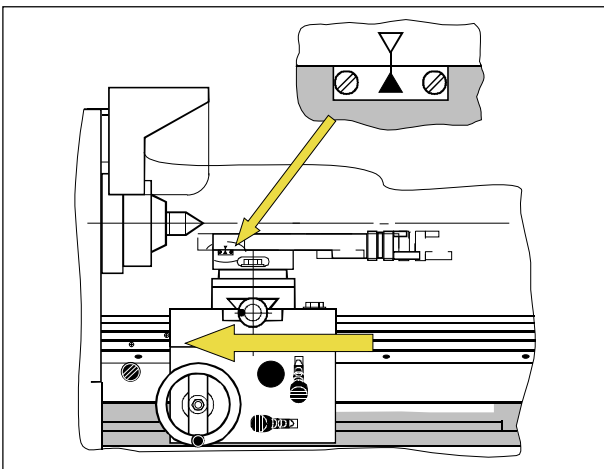
Switch-on state

Switch-on state

When switching the machine on, all path displays of the axes are flashing in red colour.

The flashing indicates that the measuring electronics have not been referenced to the machine yet. The displays show slide positions that have not been defined yet (the reference labels have not been activated yet).

Activating the reference labels

Activation of reference labels

By activating the reference labels the exact position of the slide reference points to the machine zero point M is communicated to the measuring electronics system.

After each switch-off and switch-on of the machine thus exactly the same points can be approached and the path displays always show the same positions (repeating accuracy).

Procedure:

1. Switch the machine on.

2. Traverse the longitudinal slide to the left until stop (Z direction).
   In case it is not possible to traverse the slide to the left (steady), another reference label can be selected:
   • left-hand reference label (factory setting) at the left stop
   • reference label in the center
   • right-hand reference label

   There are 3 mm bores for the center and the right-hand reference label on the sheet metal cover of the longitudinal slide. Before referencing, these bores indicate where the left side of the longitudinal slide has to be traversed.

Slide positions when activating the reference labels

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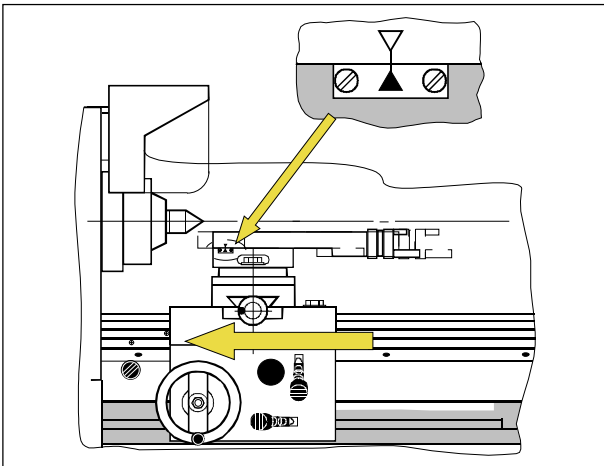
Slide positions when activating the reference labels

Note:
Traversing of slides always has to be carried out in the same direction!
If the slides happen to be traversed at a time in "+" direction and during the next activation of reference labels into "-" direction, the path display shows different absolute positions, the difference being exactly one handwheel turn.

In addition, the parameter "active reference position" has to be preset accordingly. After a parameter change, the machine has to be started again.

3. Traverse the top slide until the arrow labels of slide and guideway tally (see illustration).

4. Activate the reference mode (press the reference key).

5. Traverse all three slides in sequence in "+" direction until the individual displays stop flashing.
The displays stop flashing as soon as a reference label is traversed in the respective axis. At the same time the current absolute position of the slide reference point S in relation to the machine zero point M is displayed.

The digital readout is adjusted to the machine.

CE

It is not necessary to activate the reference point, when you press the correction key after having switched the machine on.
However, the disadvantage is that the reproducibility of stored tool points and contour points is lost since the reference points refer to the absolute values and these absolute values are changed with each machine switch-on without activation of reference labels.
Also the backlash-settlement will not work.

Tool measurment

If the same tools are used permanently the path-measuring system offers the possibility to measure tools.

The advantage is that after tool change you may continue work immediately without having to mark again by scratching before.

The data of the tools are stored as tool point N.

> **Note:**
> Working with measured tools makes sense only if the reference point was activated previously.
>
> If this is not the case, the repeating accuracy is lost from switch-off to the next machine switch-on.
>
> For tool measurement either the method "Tool measurement with touching" OR "Manual tool measurement" can be used.

Tool 1
right roughing tool

Tool 2
right side tool

Tool 3
cut-in tool

Example showing clamped workpiece
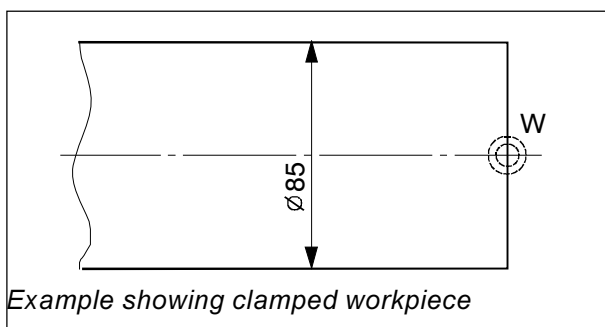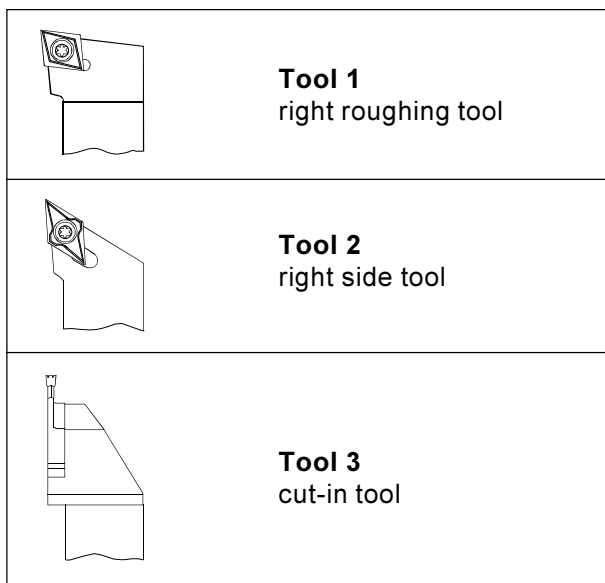
Storing tool points N

During storage of tool point N the position of the tool to the workpiece W is defined, i.e. when storing the tool point N, automatically the workpiece zero point W is defined.

Example:
The tools in the figures should be measured.

Prerequisites:
- A workpiece 85x150 mm is clamped in the machine, the front side is already faced.
  The tools are clamped in the quick-exchange tool holder and are adjusted to a rotary axis height.
- Due to the quick-exchange tool holder the positions of the tool tip to the slide reference points always remain constant, thus providing the repeating accuracy.
- Active sum display.
- Diameter display.
- The workpiece zero point W is assumed in the rotary axis at the front side of the workpiece.

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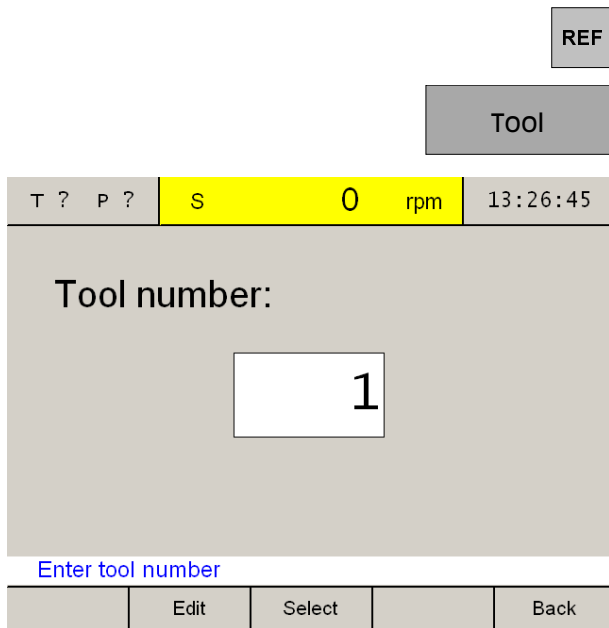
Tool measurement with touching:

1. Clamp tool 1 (right-hand roughing tool).

2. Enter the reference mode (press REF key).

3. Press the soft key "Tool".

4. Enter the tool number and confirm with "Edit". For tool calibration it is not necessary to select the tool itself.

REF

Tool

T ?	P ?	S	0	rpm	13:26:45

Tool number:

1

Enter tool number

	Edit	Select		Back

Touching in X

Reference part
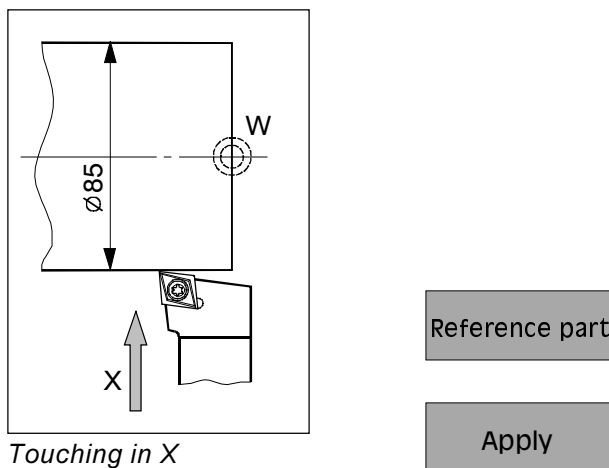
Apply

5. Enter the X value of the reference part (diameter) and confirm the value by means of the enter key.

6. Touch the workpiece in the X axis. Save the X values with the soft key "Apply".

T ?	P ?	S	0	rpm	13:33:15

Reference part (diameter):

X   85,00 mm

TOOL offset: 1

X   −29,70 mm

Touching in X-direction

Reference part		Select	Apply	Back
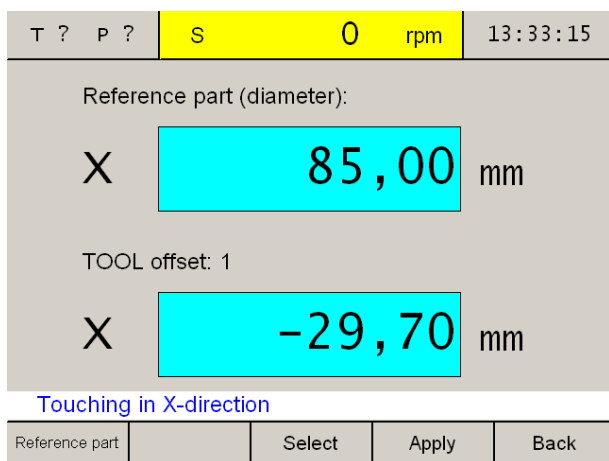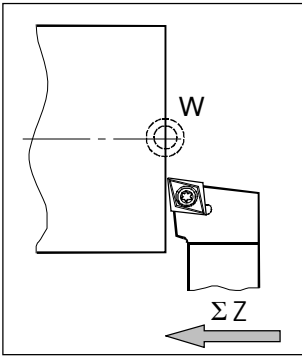
Touching in Z

Reference part

Apply

T ?	P ?	S	0	rpm	13:34:53

Reference part:

Z   0,00 mm

TOOL offset: 1

Z   8,75 mm

Touching in Z-direction

| Reference part | | Select | Apply | Back |

7. Define the Z value of the reference part with "0" (Z coordinate related to the workpiece zero point) and confirm the value with the enter-key.

8. Touch the workpiece in the Z axis (face). The sum display is automatically active.
Save the Z values with the soft key "Apply".

9. Now tool 1 is measured. The values are saved in the tool table under the respective tool number.

10. Quit the reference mode by pressing the soft key "Back" or the ESC key twice.
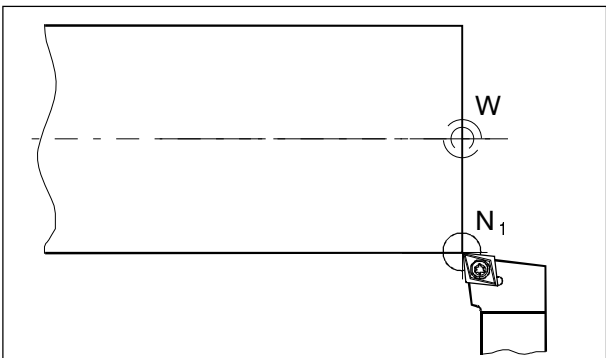
Stored tool point N_1

Carry out the points 1. to 10. for the tools 2 and 3. Tool 2 is saved under the tool number 2 and tool 3 is saved under the tool number 3.

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Manual tool measurement:
The tool dimensions can also be measured manually by means of a slide gauge.

Tools

T ?	P ?	Tools	13:39:54

No.	X position	Z position
5	-6.00	0.00
6	23.00	0.00
7	0.00	0.00
8	0.00	0.00
9	0.00	0.00
10	0.00	0.00
11	0.00	0.00
12	0.00	0.00
13	0.00	0.00

Select tool

Go to	Edit	Select	Deselect	Back

1. Call the tool table.

2. Select the tool number with the cursor keys or with the soft key "Go to".

Edit

3. Press the soft key "Edit".

Edit X   Edit Z

Apply

4. Use the slide gauge to measure the tool dimensions (see illustration) and enter the values with the soft keys "Edit X" and "Edit Z". Save with "Apply".
Prior to pressing the enter key, wrong inputs can be corrected by means of the "CE" key.

T ?	P ?	Tools	13:42:07

Tool number: 7

X   9,00 mm

Z   21,50 mm

Enter tool dimensions

Edit X	Edit Z	Select	Apply	Back
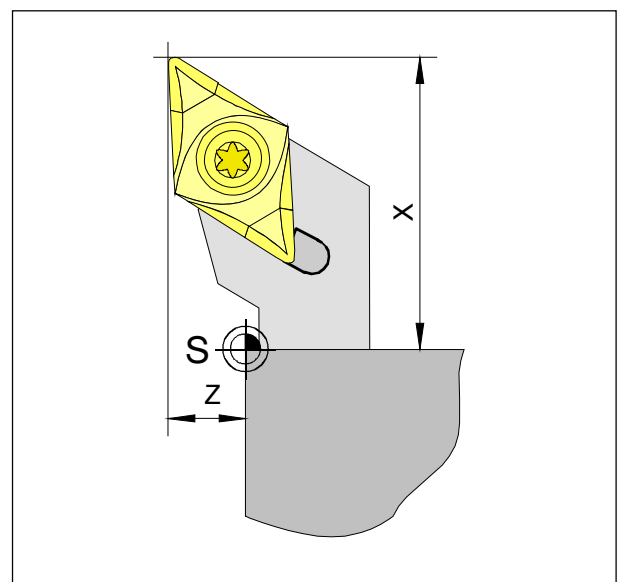
Tool dimensions

Definition of the reference point / zero offset

The soft keys "Datum point" or "Zero Offset" only appear when a tool has been selected.
Use the parameter "Datum point / zero offset" to switch between the definition of the reference point and the zero offset.
After having changed a parameter, the machine has to be started again (see changing parameters).

| Select |

| T1 | P ? | S | 0 | rpm | 16:54:35 |

$\varnothing$ X   46,00 mm

Z $_0$ 20,00 mm

Z   -20,00 mm

| Parameter | Tools | Datum point | Contour | Info |

| Datum point |

| Edit X | Edit Z |

Definition of the reference point:
Enter the coordinates of the reference point with the soft keys "Edit X" and "Edit Z". It is useful to define the reference value in Z direction with "0".

| T1 | P ? | Set datum point | 17:23:00 |

$\varnothing$ X   30,00 mm

Z   0,00 mm

| Edit X | Edit Z | | Reset | Back |

| Reset |

Use the soft key "Reset" to delete a reference point already defined.

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| Zero Offset |
| Edit X | Edit Z |

| T1 | P ? | Set zero offset | 17:21:14 |

X   **0,00** mm

Z   **0,00** mm

Enter values for zero offset

| Edit X | Edit Z | | Reset | Back |

| Reset |
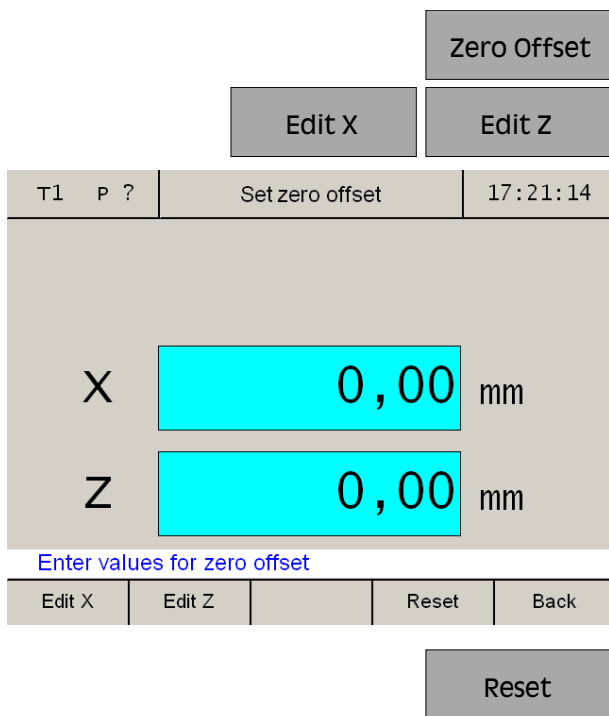
Zero offset:
Use the soft keys "Edit X" and "Edit Z" to enter the values of the zero offset.

Use the soft key "Reset" to cancel the zero offset.

Setting axes to zero

Without activated tool
All axes of the path display can be defined with any other value (e.g. 0).

The "Setting axes to zero" without activated tool can be cancelled by:
• overwriting the path displays with another value
• **selection** of a tool
• referencing the axes again
• switching the machine off

> **Note:**
> The "Setting axes to zero" does not influence any reference point that has been set, since a tool has to be selected before. When a new tool is selected, the "Setting axes to zero" is cancelled.

With activated tool
The "Setting axes to zero" with activated tool is only possible for the path display of the Z axis or for the path display of the Z_0 axis.
Thus a zero point is determined in Z-axis direction, where the path displays of both the Z axis and the Z_0 axis refer to. If a value is added up in the path display of the Z_0 axis, the corresponding amount will be subtracted in the path display of the Z axis (and the other way round).

The "setting axes to zero" with activated tool is cancelled by:
• overwriting the path displays with another value
• **deselection** of the chosen tool
• referencing the axes again
• switching the machine off

Storing of contour point

The contour points P serve as ancillary points with workpieces which always remain equal.
The prototype has to be machined only once by means of the path displays.
The remaining workpieces are machined simply by approaching the stored contour points.

> **Note:**
> A maximum of 999 contour points can be saved (standard setting 99 contour points; can be set with parameter "Contour points").

Definition of contour points by means of workpiece sketches

Prior to machining, you can use a workpiece sketch to enter all contour points into the contour point table.

Contour

T ?	P ?	Contour points	17:30:35

No.	Diameter	Z position	TOOL:
1	0.00	0.00	0
2	0.00	234.00	0
3	210.03	176.09	0
4	212.21	178.27	0
5	214.40	180.46	0
6	218.78	184.84	0
7	223.15	189.21	0
8	225.34	191.40	0
9	229.71	195.77	0

Select contour point

Go to	Machine	Select	Deselect	Back

Machine

Edit

Edit X	Edit Z

1. Call the contour point table.

2. Select a contour point with the cursor keys or with the soft key "Go to".

3. Press the soft key "Machine".

4. Press the soft key "Edit".

5. Enter the contour values from the workpiece sketch by means of the soft keys "Edit X" and "Edit Z".

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```
 T ?  P ?        Contour points        17:32:23

   Contour point: 1  for TOOL: 0

    X  [    25,00    ]  mm

    Z  [   -14,50    ]  mm

   Enter coordinates of contour point
  Edit X    Edit Z             Apply    Back
```

[Apply]

[Edit Tool]

```
 T ?  P ?        Contour points        17:35:06

   No.     Diameter Z position      TOOL:

    1       25.00       -14.50         1
    2        0.00         0.00         0
    3        0.00         0.00         0
    4        0.00         0.00         0
    5        0.00         0.00         0
    6        0.00         0.00         0
    7        0.00         0.00         0
    8        0.00         0.00         0
    9        0.00         0.00         0

   Select contour point
  Edit    Edit Tool   Insert   Remove   Back
```


Example of a workpiece

Save with "Apply".
Prior to pressing the enter key, wrong inputs can be corrected by means of the "CE" key.

6. In addition to the axis coordinates of the contour point you can enter the matching tool. Press the soft key "Edit Tool" and define the tool number of the tool that should traverse the contour point. If no new tool is entered, the prior tool will remain active.
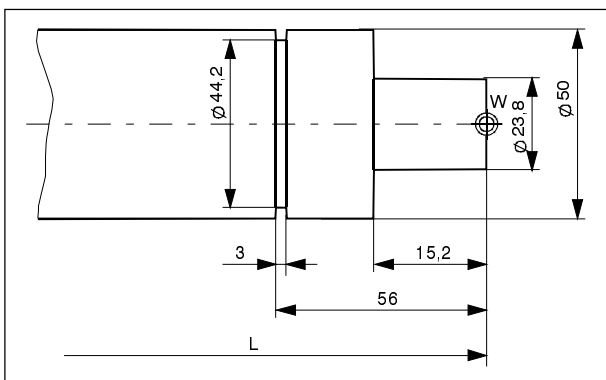
Definition of contour points with prototype machining

Example:

The illustrated workpiece is to be machined in series.
The tools already measured 1(right roughing tool), 2 (right side tool) and 3 (cut-in tool) are required.
The workpiece ø85 mm to which the workpiece zero point W was stored remains clamped.

Procedure:

The first workpiece (prototype) is manufactured by means of a slide gauge or similar measuring instruments.
Characteristic contour points of the workpiece are stored.
With all further workpieces only the stored contour points are activated and approached.
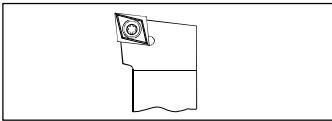
Clamp tool 1

Select

REF

Contour

1 | **Edit**

14,5

W
∅ 25
K₁
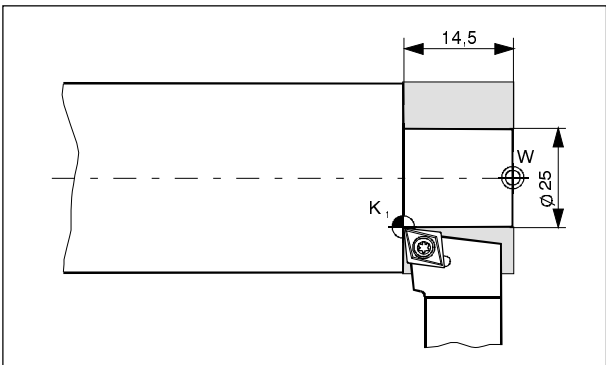
Turn off workpiece to roughing tolerance

| T1 | P ? | S | 0 | rpm | 17:59:00 |

Contour point: 1

∅ X   **25,00** mm

Z   **−14,50** mm

Approach position for contour point 1 and save it

| | | Select | Apply | Back |

Apply

Back

1. Clamp the roughing tool (tool 1) and select the tool from the tool table.
   The path display indicates the position of the tool tip in relation to the workpiece zero point.

2. Enter the reference mode (press the REF key).

3. Press the soft key "Contour".

4. Enter the number of the contour point (in this example start number 1) and confirm with "Edit".

5. Turn until you reach the roughing tolerance and leave the turning tool exactly in the final machining point (see illustration).
   This point should be saved as contour point P_1.

   Press "Apply" to save the contour point P_1.
   After having saved, the next contour point is automatically called for machining.
   In this example you should change to tool 2 (right-hand roughing tool) for the contour point 2.

6. Quit the reference mode by pressing the soft key "Back" or the ESC key three times.

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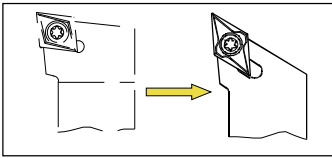
Tool change

Select

REF

Contour

2	Edit
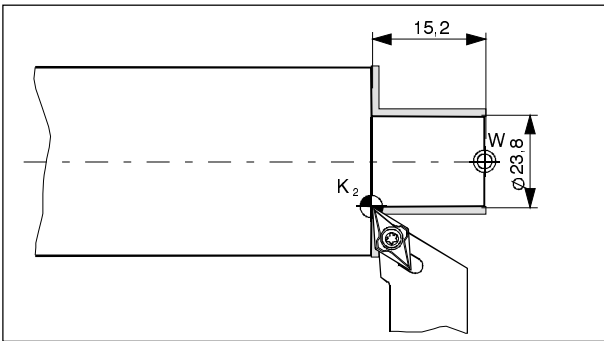
Turning to smoothing tolerance

| T1 | P? | S | 0 | rpm | 18:05:03 |

Contour point: 2

$\varnothing$ X | 23,80 | mm

Z | −15,20 | mm

Approach position for contour point 2 and save it

| | | Select | Apply | Back |

Apply

Back

7. Clamp the tool 2 (right-hand tool) and select the tool from the tool table.
   The path display indicates the position of the tool tip in relation to the workpiece zero point.

8. Enter the reference mode (press the REF key).

9. Press the soft key "Contour".

10. Enter the number of the contour point and confirm with "Edit".

11. Continue turning up to the finishing offset and leave the tool exactly in the corner point again. This point should be saved as contour point P_2.

    Press "Apply" to save the contour point P_2.
    After having saved, the next contour point is automatically called for machining.
    In this example you should change to tool 3 (cutting-off tool) for the contour point 3.

12. Quit the reference mode by pressing the soft key "Back" or the ESC key three times.
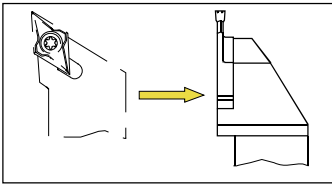
Tool change

Select

REF

Contour

3	Edit
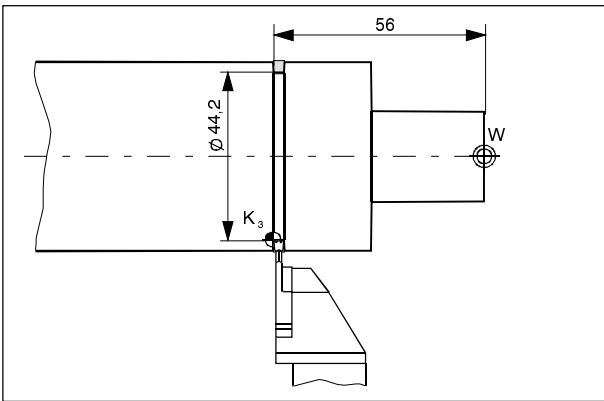
Turn cut-in

T1	P?	S	0	rpm	18:07:35

Contour point: 3

$\varnothing$ X   **44,20** mm

Z   **−56,00** mm

Approach position for contour point 3 and save it

		Select	Apply	Back

Apply

Back

13. Clamp the cutting-off tool (tool 3) and select the tool from the tool table.
The path display indicates the position of the tool tip in relation to the workpiece zero point.

14. Enter the reference mode (press the REF key).

15. Press the soft key "Contour".

16. Enter the number of the contour point and confirm with "Edit".

17. Turn the groove and leave the tool exactly in the groove.
This point should be saved as contour point P_3.

Press "Apply" to save the contour point P_3. After having saved the next contour point is automatically called for machining.

18. Quit the reference mode by pressing the soft key "Back" or the ESC key three times.

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Activating and approaching contour points

Activating and approaching contour points facilitates machining of series of equal workpieces.

> **Note:**
> Make sure that together with the activated (called) contour point P there is always the tool clamped, that was clamped during saving the contour point. Also take care that the corresponding tool is selected.

Example:

The workpiece machined in the previous example (storing contour points) now is to be machined again by activating and approaching the contour points.

An unmachined piece with the same diameter (ø85 mm) and the same length L is clamped, the front side being already faced.

With an unmachined piece with a different length L only the workpiece zero point W has to be stored again before, for the rest, the procedure is similar to the one described here.
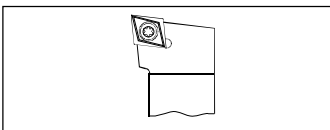

Clamp tool 1

Procedure:

1. Clamp the roughing tool (tool 1) and select the tool from the tool table.
   The path display indicates the position of the tool tip in relation to the workpiece zero point.

2. Call the contour table.

3. Select the contour point with the cursor keys or the soft key "Go to".

4. Press the soft key "Select".

5. Press the soft key "Back".

Contour

Select

Back

14,5

W

Ø 25

K₁

Turn off workpiece to roughing tolerance

6. In the axis displays the paths to go that still have to be traversed appear on a yellow background with the symbol Δ (see path to go - display).
   Continue turning the workpiece until the axis displays show the value "0".
   Now the tool is exactly positioned in the saved contour point P₁.
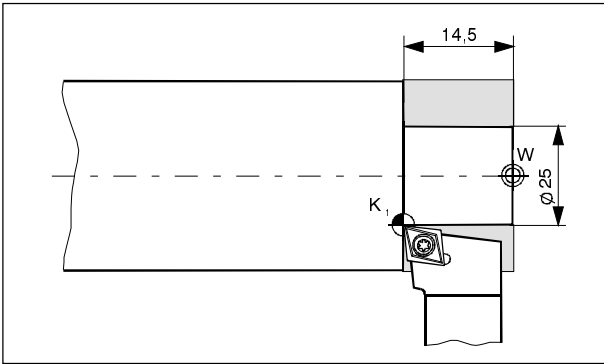
| T1 | P1 | S | 0 | rpm | 18:17:50 |

$$\varnothing \triangle X \qquad 3{,}160 \; \text{mm}$$

$$\Sigma \triangle Z \qquad 1{,}350 \; \text{mm}$$

Contour point reached. Select next point with ENTER.

| Parameter | Tools | Datum point | Contour | Info |

Approach stored values for P₁

The message, when the contour point will be reached in the X, respectively Z direction, appears in the alarm- and message line on time. The range, where the message will appear, can be defined by means of the parameters "Target range X" and "Target range Z" (see changing of parameters).

Tool change

ENT

Select

7. Select the next contour point with the "Enter" key.

8. Clamp the tool 2 (right-hand tool) and select the tool in the tool table.

15,2

W

Ø 23,8

K₂

Turning to smoothing tolerance

9. In the axis displays the paths to go that still have to be traversed, appear on a yellow background with the symbol Δ.
   Continue turning the workpiece until the axis displays show the value "0".
   Now the tool is exactly positioned in the saved contour point P₂.

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T2	P2	S	0	rpm	11:20:24

$\varnothing\triangle X$ **2,56** mm

$\Sigma\triangle Z$ **0,64** mm

Contour point reached. Select next point with ENTER.

Parameter	Tools	Datum point	Contour	Info

The message, when the contour point will be reached in the X, respectively Z direction, appears in the alarm- and message line on time. The range, where the message will appear, can be defined by means of the parameters "Target range X" and "Target range Z" (see changing of parameters).

Tool change

ENT

Select

10. Select the next contour point with the "Enter" key.

11. Clamp the cutting-off tool (tool 3) and select the tool from the tool table.

Turn cut-in

12. In the axis displays the paths to go that still have to be traversed, appear on a yellow background with the symbol $\triangle$.
Continue turning the workpiece, until the axis displays show the value "0".
Now the tool is exactly positioned in the saved contour point P_2.

T3	P3	S	0	rpm	11:22:53

$\varnothing\triangle X$ **1,40** mm

$\Sigma\triangle Z$ **1,31** mm
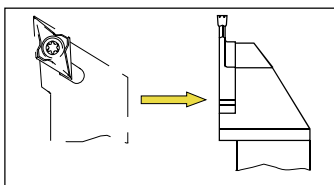
Contour point reached. Select next point with ENTER.

Parameter	Tools	Datum point	Contour	Info

The message, when the contour point will be reached in the X, respectively Z direction, appears in the alarm- and message line on time. The range, where the message will appear, can be defined by means of the parameters "Target range X" and "Target range Z" (see changing of parameters).

Insert / remove contour point

Contour

Machine

T ?	P ?	Contour points	11:35:09

No.	Diameter	Z position	TOOL:
1	25.00	-14.50	1
2	23.80	-15.20	0
3	0.00	0.00	0
4	0.00	0.00	0
5	44.20	-56.00	0
6	100.00	100.00	0
7	30.00	0.00	0
8	30.00	0.00	0
9	30.00	0.00	0

Select contour point

Edit	Edit Tool	Insert	Remove	Back

Insert	Remove

1. Press the soft key "Contour".

2. Press the soft key "Machine" .

3. Select the contour point with the cursor keys.

Use the cursor keys to traverse to the respective position. With Insert / Remove contour points can be inserted or removed.

4. Blank lines can be added with the soft key "Insert". Exisiting lines can be deleted with the soft key "Remove".

Quit the contour point mode

Contour

T3	P3	Contour points	12:02:55

No.	Diameter	Z position	TOOL:
1	25.00	-14.50	1
2	23.80	-15.20	0
3	44.20	-56.00	0
4	100.00	100.00	0
5	30.00	0.00	0
6	30.00	0.00	0
7	30.00	0.00	0
8	30.00	0.00	0
9	30.00	0.00	0

Select contour point

Edit	Edit Tool	Insert	Remove	Back

Deselect

Back

1. Press the soft key "Contour".

2. Press the soft key "Deselect".

3. Press the soft key "Back".

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Constant cutting speed (v$_{const}$)

This function enables the automatic adjustment of the speed to the turnig diameter. The cutting speed remains constant. The larger the diameter the lower the speed.

The maximum deviation of the spindle speed control is 5%.

Activating of v$_{const}$

> **Note:**
> Activation of v$_{const}$ is only possible after having activated the reference labels.

When activating v$_{const}$ the speed for the smallest diameter to be turned must be selected = maximum speed.

Example:

A workpiece should be machined with a constant cutting speed of v = 75 m/min. The smallest diameter to be turned is ø10 mm.

1. Select the speed n from the diagram "Cutting speed" in the chapter "B Description and operation of the machine".

   v = 75 m/min, d = 10 mm, $\Rightarrow$ **n = ~2350 rpm**

   The speed can also be calculated (see "Cutting speed" in chapter B).

2. Switch on main spindle. Traverse with the tool to the smallest diameter (ø10 mm) to be turned.

3. Set the speed (n = 2350 rpm).

4. Use the key "v$_{const}$" to activate v$_{const}$. The spindle speed display changes to m/min.
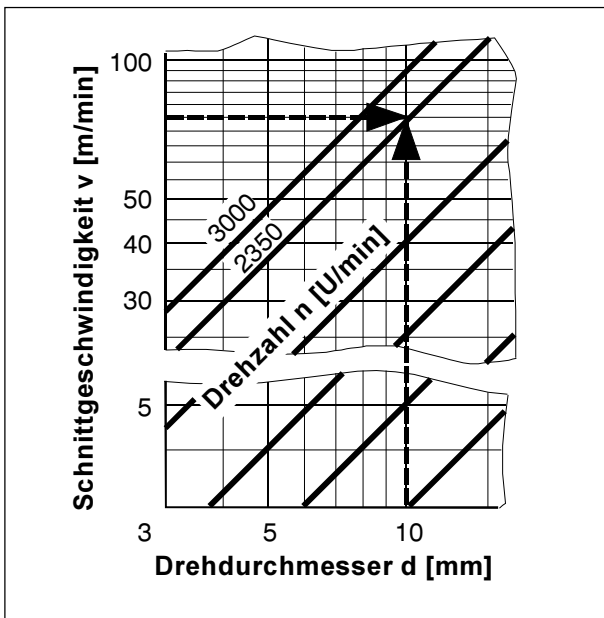
Selection of the correct speed

VKonst   **75**   m/min

Spindle speed display with v_{const} being active.

The v_{const} function is active now.

If the tool is machined the speed decreases with increasing diameter. The maximum speed is limited to n = 2350 rpm. Also if diameters are turned which are smaller than ø10mm.

Notes:
- If v_{const} is active, the speed may not be changed by turning the controller.
- The function v_{const} takes into account the programmed (measured) tools.
  If a second tool is clamped and the resp. tool data are called up the speed is set for this tool.
  (The speed would be also n = 2350 rpm at turning diameter ø10 mm for the second tool in this example.)

Deactivating v$_{const}$

Note:
For safety reasons the v_{const} function can only be switched off, when the main spindle stands still.

1. Switch off main spindle.

V$_{const}$

2. Use the key "v_{const}" to deactivate v_{const}. The spindle speed display changes to rpm again.

S   **0**   rpm

The v_{const} function is deactivated.

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T ?	P ?	Ref-Mode	40-130

REF | System

⌀ X `0,000` mm

Z₀ `0,000` mm

Z `0,000` mm

| diagnose | import | export | | Back |

System

In the system (activate the reference mode) you can export important system data.

diagnose

Diagnosis function

In the diagnosis area, the inputs and outputs of the PLC are displayed.
Active alarms and messages can also be displayed.

Data import and export

import | export

With these soft keys it is possible to export machine data, tool data and contour data on an USB stick or to import the data from the USB stick into the digital readout. Alterations due to an import of machine data are only captured after a new start of the machine.

⚠

Caution:
Existing data are overwritten during a data import!

Error messages

Alarms of the spindle speed display E01 - E11
These alarms are displayed by the spindle speed display.

E01 Monitoring EMERGENCY-OFF relay
Reason: Error at the EMERGENCY-OFF relay on the board Y2A121001
Remedy: Switch the machine off and on; replace board Y2A121001

E02 SPS time out
Reason: SPS has not reported, error in SPS
Remedy: Switch machine off and on; replace SPS

E04 Underspeed main spindel caused by PIC-Controller (circuit board)
Reason: Spindle rotation is too less or the monitoring switch for the overspeed is defect.
Remedy: Switch machine off and on; possibly the 3-fold potentiometer is defect.

E05 Overspeed main spindle caused by PIC-Controller (circuit board)
Reason: Spindle speed is too high
Remedy: Check nominal value sent to frequency converter, check frequency converter

E08 Error safety safety circuit HW error : K1, K2, K3, PIC-Controller (circuit board) time out
Reason: K1, K2, K3 do not function properly, possibly welded contact, PIC-Controller (circuit board) does not answer
Remedy: Replace K1, K2 or K3 , replace PIC-Controller (circuit board) Y2A121001

E09 Gear step changes during operation
Reason: During operation the electric gear step was switched (this is not allowed).
Remedy: Set spindle switch to "Zero" position

E10 Overspeed main spindle caused by SPS
Reason: Spindle speed is too high
Remedy: Check nominal value sent to frequency converter, check frequency converter

E11 Error main spindle converter
Reason: Error message of the main spindle converter
Remedy: Switch machine off and on, replace converter, mind excess temperature of the motor, earth fault or over-current of the motor

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Alarms of the digital position display

These alarms of the digital position display are displayed in the alarm and message line.

6000 EMERGENCY-OFF
Reason: EMERGENCY-OFF switch was pressed or PIC-Controller (circuit board) has carried out the EMERGENCY-OFF!
Remedy: Unlock the EMERGENCY-OFF button when PIC-Controller (circuit board) has switched off; consider the ERROR message at the display. Switch the machine off and then on again.

6001 Safety circuit fault<
Reason: K1, K2 or K3 has not switched correctly or the PIC-Controller (circuit board) does not answer.
Remedy:Switch the machine off and then on again. In case the error appears again, please contact the service.

6002 Speed overrun
Reason: Main drive has too high spindle speeds in comparison to the speeds set at the potentiometer.
Remedy: Switch the machine off and then on again.
In case the error appears again, please contact the service.

6003 Chuck cover open
Effect: Main spindle is stopped by a mechanical brake built in the motor.
Reason: Chuck cover is open when main spindle is running.
Remedy: Switch off the main spindle switch and close the chuck cover.

6004 Gearbox cover open
Effect: Main spindle is stopped by a mechanical brake which is built in the motor.
Reason: Gearbox cover is open when main spindle is running.
Remedy: Switch off the main spindle switch and close the gearbox cover.

6005 Const. surface speed only in clockwise direction
Reason: It is only allowed to activate the constant cutting speed during clockwise run.
Remedy: Switch the machine to clockwise run.

6006 Gear change only with spindle stop
Reason: It is only allowed to change the electrical gear position during standstill.
Remedy: Turn the spindle switch to ZERO position.

6007 Main drive not ready
Reason: Failure of the frequency converter. The failure may have been caused by excess temperature of the motor.
Remedy: Switch the machine off and then on again. If the error appears repeatedly, please contact the service. Let the motor cool down.

6008 Safety circuit fault K1/K4
Consequence: Machine stops.
Cause: K1 or K4 defective, wiring defective, ACC defective. K4 is the auxiliary relay for the supply current safety circuit of the frequency converter K1.
In case of unselected auxiliary relay K4 (A 10.0 = 0-Signal) the safety circuit K1 must be de-energised and a 1-signal present at E 4.3. Likewise, in case of a selected auxiliary relay K4 (A 10.0 = 1-signal) the supply current safety circuit K1 must be energised and E 4.3 have a 0-signal (switch check time 500ms in each case).
The sequence following machine power-up: After the rotation speed indicator board initiated faultlessly (at ACC E 5.1=1signal // EMERGENCY SHUTOFF), the supply current safety circuit K1 is de-energised and there is a 1-signal at E 4.3, the auxiliary relay K4 is switched on with the A 10,0. Thereby the E 4.3 must switch to a 0-signal within 500ms.
In case of EMERGENCY SHUTOFF, excessive temperature brake resistance, and the overspeed and underspeed alarms as well as all safety circuit HW-faults the A 10.0 is switched off.
Troubleshooting: Switch the machine off and on again. Contact service if the fault reoccurs.

6009 Safety circuit fault K2/K5

Consequence: The machine stops.

Cause: K2 or K5 defective, wiring defective, ACC defective.

K5 is the auxiliary relay for the main spindle safety circuit K2. In case of an unselected auxiliary relay K5 (A 10.1 = 0-signal) the main spindle safety circuit K2 must be de-energised and a 1-signal present at E 4.4. Likewise in case of a selected auxiliary relay K4 (A 10.1 = 1-signal) the main spindle safety circuit K2 must be energised and the E 4.4 have a 0-signal. (Switch check time 500ms in each case.)

The A 10.1 is switched on if the chuck safety is closed, there is no EMERGENCY SHUTOFF, the wheel cap is closed, the main spindle switch is not in the 0 position (right or left on), and the A 10.2 release is in the on direction.

The A 10.1 is switched off if the main spindle switch is in the 0 position and the rotation=0 signal comes from the frequency converter.

Troubleshooting: Switch the machine off and on again. Contact service if the fault reoccurs.

6010 Safety circuit fault K3/K7

Consequence: Machine stops.

Cause: K3 or K7 defective, wiring defective, ACC defective. K7 is the auxiliary relay for the main spindle brake safety circuit K3. In case of an unselected auxiliary relay K7 (A 10.3 = 0-signal) the main spindle brake safety circuit K3 must be de-energised and a 1-signal present at E 4.5. Likewise in case of a selected auxiliary relay K4 (A 10.3 = 1-signal) the main spindle brake safety circuit K3 must be energised and the E 4.5 must have a 0-signal (switch check time 500ms in each case).

The A 10.3 is switched on (brake released) if the frequency converter reports rotation=0, there is no EMERGENCA SHUTOFF, the wheel cap is closed, and the A 10.2 release is in the on direction.

The A 10.3 is switched off in case of "Alarm 6003 chuck safety open". The brake is activated if the main spindle switch is in the right- or left-hand motion position (=main spindle runs) and the chuck safety is opened.

The A 10.3 is also switched off if the mechanical brake is activated in the setting data and the main spindle is switched off in both high gears.

The brake is released again when the drive is stationary.

Troubleshooting: Switch the machine off and on again. Contact service if the fault reoccurs.

6011 Speed underrun

Consequence: Machine stops.

Cause: The rotation real value of the main spindle is lower than the rotation set point.

Troubleshooting: Switch off the main spindle switch.

6012 Overload brake resistor

Consequence: Machine stops.

Cause: Can occur in case of frequent changes of the rotation direction with very heavy turned parts.

Troubleshooting: Wait until the resistance cools down, possibly activate the mechanical brake (condition when delivered) and carry out the change of direction only when the main spindle is stationary.

6013 Safety circuit fault PIC

Consequence: Machine stops.

Cause: The ACC and the indicator board monitor each other with an approx. 0.5 Hz frequency signal. The alarm occurs if the signal is interrupted (wiring defective, indicator board defective).

Troubleshooting: Switch the machine off and on again. Contact service if the fault reoccurs.

6014 Change of speed during const.surface speed

Consequence: Machine stops.

Cause: In case of an active V-const the main spindle speed may no longer be adjusted by turning the speed control.

Troubleshooting: Turn the main spindle switch off.

7000 Chuck cover open

Effect: It is not possible to switch the main spindle on.

Reason: The chuck cover is open.

Remedy: Close the chuck cover.

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8262 Reference marks are not close enough!
Effect: The concerned axis (with linear scale) cannot be referenced.
Reason: The settings of the linear scale had been changed or the linear scale is defect.
Remedy: Change the settings, respectively contact the service.

8263 Reference marks are too close together!
Effect: The concerned axis (with linear scale) cannot be referenced.
Reason: During the referencing process the direction of the axis was reversed or the linear scale is defect.
Remedy: Always reference the axis in one direction (positive axis direction), respectively contact the service.