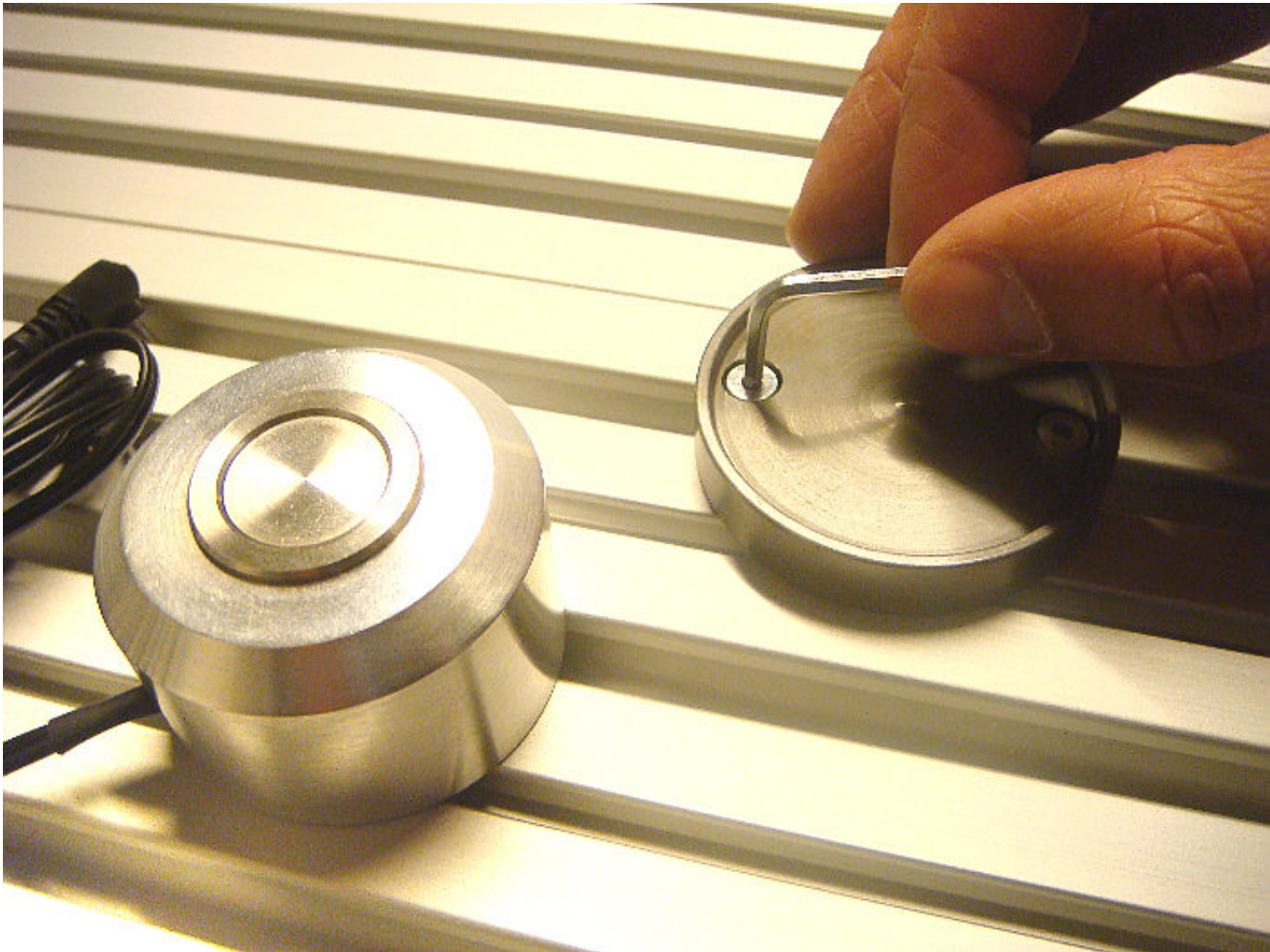# Operating Manual for the Tool 100 Length Sensor

Hylewicz CNC-Technik

Siemensstraße 13 15
Gewerbegebiet Weseler Straße
D-47608 Geldern
Telephone: +49 (0) 2831 13 32 36
Telefax: +49 (0) 2831 13 32 37
E-mail: info@cnc-step.com
Internet: www.cnc-step.de

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This operating manual describes the installation, setup, and operation of the Tool 100 Length Sensor with High-Z, RaptorX, and T-Rex milling machines when using the WinPC-NC software.

It is important to read this manual completely before attempting installation, setup, and operation of the Tool 100 Length Sensor.

Further details can be found in the WinPC-NC manual.

Technical Description

The Tool 100 Length Sensor assists with tool length compensation during automated or manual tool changes.

Requirements for the use of the Tool 100 Length Sensor

- Tool 100 Length Sensor
- A High-Z, RaptorX, or T-Rex milling machine
- WinPC-NC Economy, USB, or Professional
- T-Groove plates for mounting (optional)

Decide How The Tool 100 Length Sensor Will be Used

The Tool 100 Length Sensor may be operated in three different ways:

- As an automatic tool length compensation device

- As an aid for setting Z0 of a job

- Combination operation

As an automatic tool length compensation device

In this mode of operation the Tool 100 Length Sensor is mounted inside the cutting area of the machine. After a tool change is performed, the machine will automatically move to the location of the Tool 100 Length sensor, adjust for any tool length differences, and then continue with the job using the changed tool.

As an aid for setting Z0 of a job

In this mode of operation the Tool 100 Length Sensor is mounted outside the cutting area of the machine. After a tool change is performed, the Tool 100 Length Sensor is moved to the work area, is manually used to correct for any tool length differences, and is then returned to its mounting location.

Combination operation

In this mode of operation the Tool 100 Length Sensor is mounted inside the cutting area of the machine. The Z0 of the job is set by moving the sensor to work area and used, manually, to set Z0. It is then returned to its base. Subsequent tool changes will automatically move to the location of the Tool 100 Length sensor, adjust for any tool length differences, and then continue with the job using the changed tool.

Mechanical Installation

The Tool 100 Length Sensor must have its base mounted on the T-Groove plate using the two screws and T-Groove nuts provided.

As an aid for setting Z0 of a job

Mount the base of the Tool 100 Length Sensor anywhere on the T-Groove plate - but ensure that the mounting location is outside the cutting area of the machine.

Automatic tool length compensation or combination operation

Put a tool - a "V" tool or ball nosed end mill work best - in the router/spindle, raise the spindle to Z0 in machine units (as far up as the spindle will go) and jog the spindle towards the preferred mounting corner until the limit stops trip. Back off slightly in the X and Y directions.

Mount the Tool 100 Length Sensor base in the T-Groove closest to the Y location of the spindle. Place the Tool 100 Length Sensor on its base and slide the base as close to the corner as you can. Jog the spindle and move the base/sensor combination around until the tool is centered over the Tool 100 Length Sensor.

Record the position of the sensor in machine units - its X and Y location. Remove the Tool 100 Length Sensor from its base and tighten the two screws to establish a permanent, fixed location.

Wiring the Tool 100 Length Sensor

Run the wire from the Tool 100 Length Sensor to its plug underneath the T-Groove plate and plug it into its connector. You can find the location of the Tool 100 Length Sensor plug in your machine manual.

If you are planning to use the Tool 100 Length Sensor as a Z0 aid or for combination operation, ensure that there is sufficient wire to move the Tool 100 Length Sensor anywhere within the cutting area. When the Tool 100 Length Sensor is returned to it base, the wire must be able to be stored clear of the work area.

If the wire is not cleared of the work area before milling begins, damage to the Tool 100 Length Sensor wire can result!

You may wish to use a cable tie to "clean up" any excess wire.

# Verifying the Tool 100 Length Sensor and its Wiring

1. Power up the Zero3 controller, and open WinPC-NC.

2. Go to "Special Functions -> Signal Test".

   Depress the sensor button by hand and observe how the "Length sensor" indicator changes. It should change from black to red. (Pictures 1 and 2)

   If the opposite happens (the indicator changes from red to black):

   a) Go to "Parameters -> Machine Parameters -> Signals"

   b) Look on the left side under "Inputs".

   c) Go to pinout option "I221 Surface Sensor" and switch the logic.

   (From " LPT1 Pin 15" to " LPT1 15 inv" or vice-versa.)

3. Go to "Special Functions -> Signal Test".
   Ensure the indicator now is black and turns red when the sensor is depressed.
4. Exit and restart WinPC-NC.
5. Repeat step one to ensure that the sensor is functioning as expected.
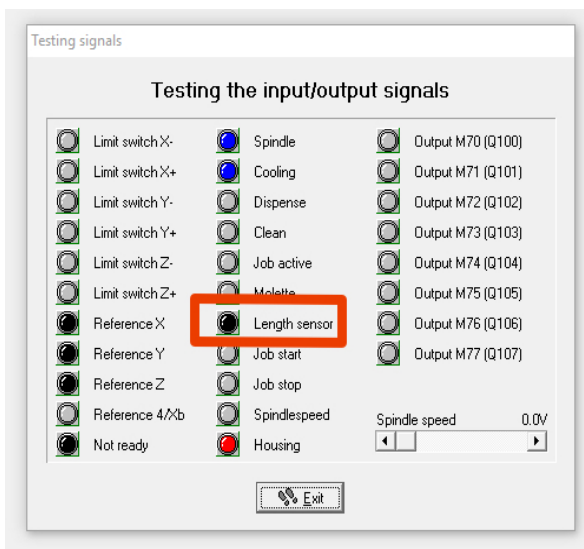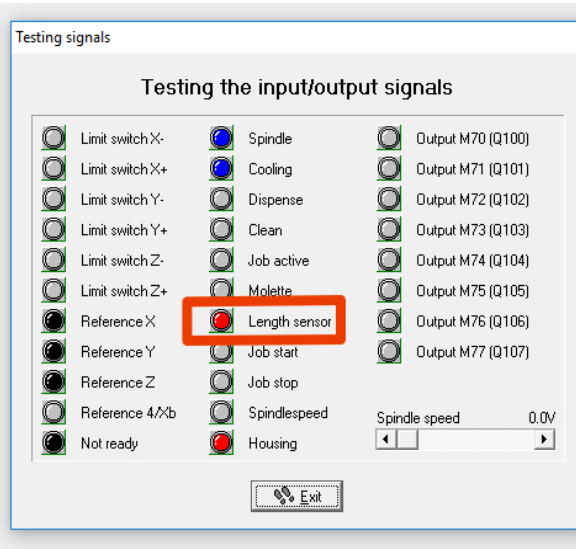
Picture 1   Picture 2

Setting the Park Position

Skip this step if your machine has an Automatic Tool Changer (ATC).

The WinPC-NC software maintains a location known as the "park position". This is a fixed location that your machine may be moved to. The machine should be moved to this location before the machine is moved (e.g. shipped) or powered down. It is also useful for tool changes.

The "park position" is entirely separate from the Tool 100 Length Sensor location. The "park" and sensor positions may be the same - or different. Whatever works best for you. To have a "park position" separate from the sensor position, do the following:

1. Reference your machine.
2. Jog your machine to the location that makes manually changing tools easy.
    Record the position in machine units - its X and Y location.
3. Go to "Parameters -> Co-ordinates"
    Enter the X and Y locations in the "Park position" area. Set the Z value to 0.
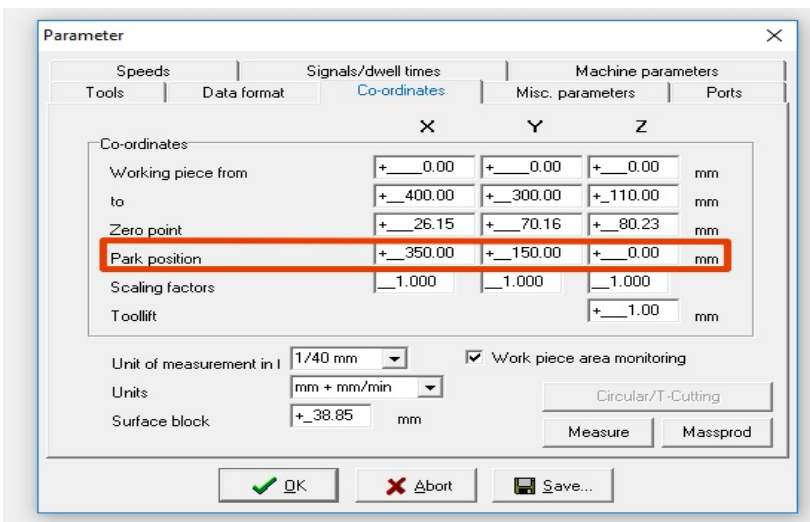
4. Select the "Misc. parameters" tab

       Click on the "Change tools" selection and set it to "Yes, at park position".
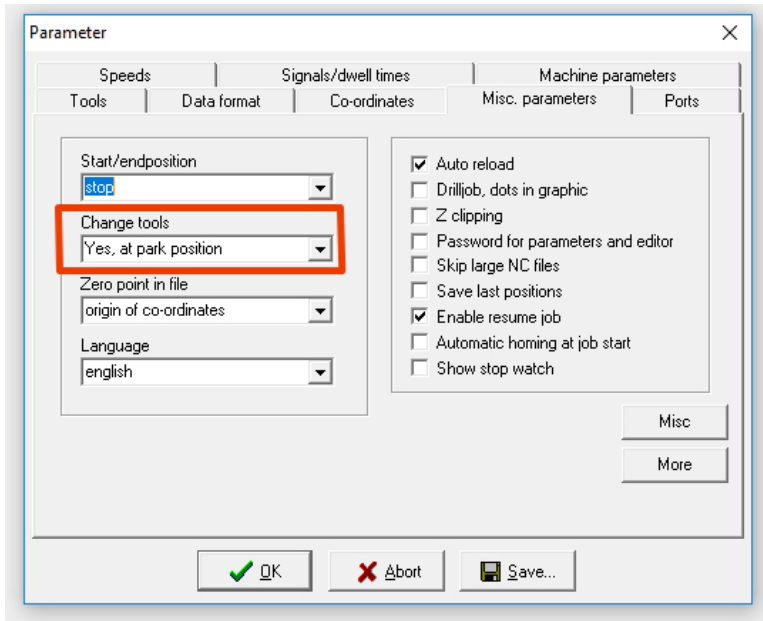
5. Click on the "Save" button, then the "Exit" button.

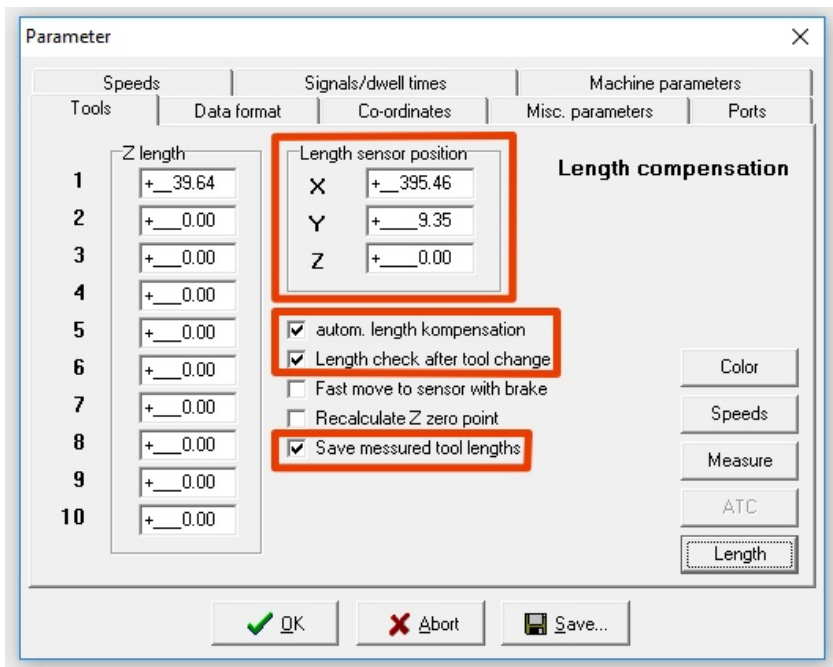6. Exit and restart WinPC-NC.

7. Inspect the settings to ensure that they are set as intended.

Now, when a tool change is requested the machine will move to the "park position".
There, a manual tool change can be performed easily. Hit OK, and the machine will move
to its next location and continue its work.

Setting Up the Tool 100 Length Sensor as an Automatic Tool Length Compensation Device

1. Go to "Parameters -> Tools".

      a) Click on the "Length" button.

      b) Enter the location of the Tool 100 Length Sensor determined in the "Mechanical Installation" section (page 4) in the "Length sensor position" area. Set the Z value to 0.

      c) Check "autom. length kompensation".

      d) Check "Length check after tool change".

      e) Check "Save measured tool lengths".

2. Go to "Parameters -> Machine parameters"

   Set "Length measurement and compensation".
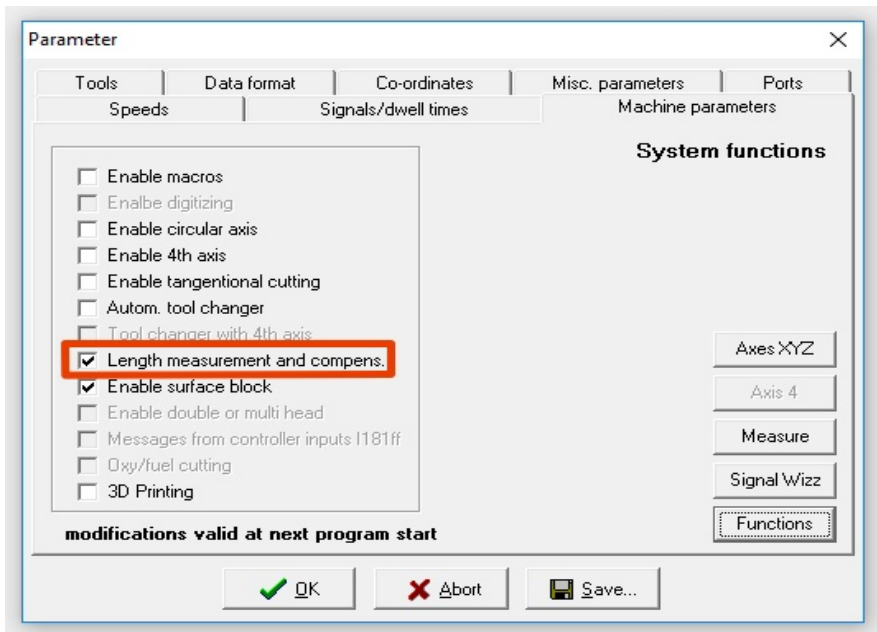
3. Hit the "Save" button then hit the "OK" button.

4. Exit and restart WinPC-NC.

5. Inspect the settings to ensure that they are set as intended.

Usage

1. Mount the first tool for the job.

2. Hit the "Select tool" button and select the "1" Length button.

   The tool length will be measured.

3. Set Z0 for the job using whatever method you prefer.

4. Load your job and begin.

   Tool length changes will be properly compensated.

# Setting Up the Tool 100 Length Sensor as an Aid for Setting Z0 of a Job

1. Go to the "Calibrating The Tool 100 Length Sensor" section (page 15), perform the actions specified there, and return here.
2. You're done!

Usage

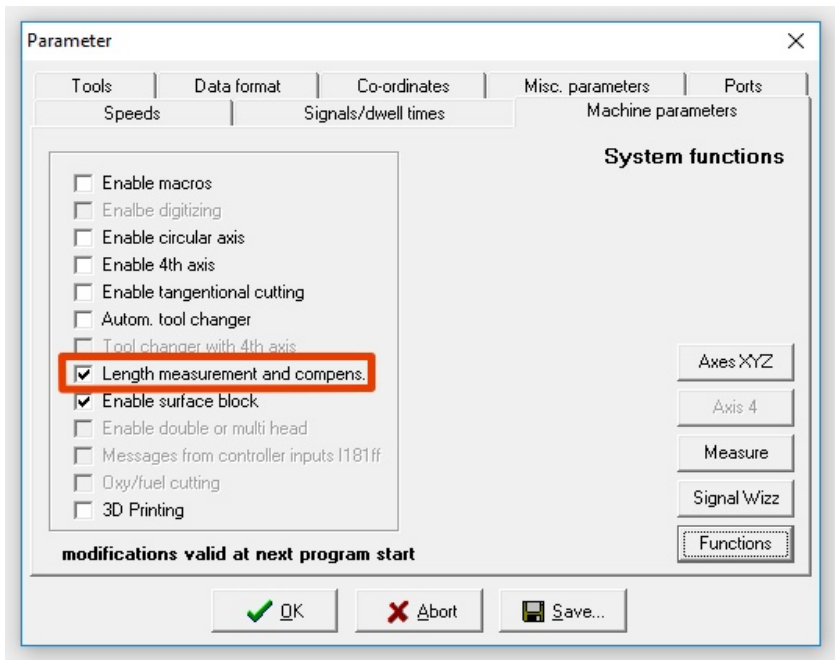1. Mount a tool for the job.
2. Position the Tool 100 Length Sensor.

   On the top of your stock for job Z0 on top of stock.

   On the top of your spoiler for job Z0 on the bottom of stock.
3. Jog the tool over the center of the Tool 100 Length Sensor.
4. Use "Move to -> Block - zero point Z" to determine Z0.
5. Return the Tool 100 Length Sensor to its base.

   Ensure the wire is clear of the cutting area.
6. Load your job and begin.
7. When a tool change comes up, repeat steps 1-5 for each tool.

Setting Up the Tool 100 Length Sensor as a Combination Device

1. Go to the "Calibrating The Tool 100 Length Sensor" section (page 15), perform the actions specified there, and return here.
2. Go to "Parameters -> Tools".
   a) Click on the "Length" button.
   b) Enter the location of the Tool 100 Length Sensor determined in the "Mechanical Installation" section (page 4) in the "Length sensor position" area.
   Set the Z value to 0.
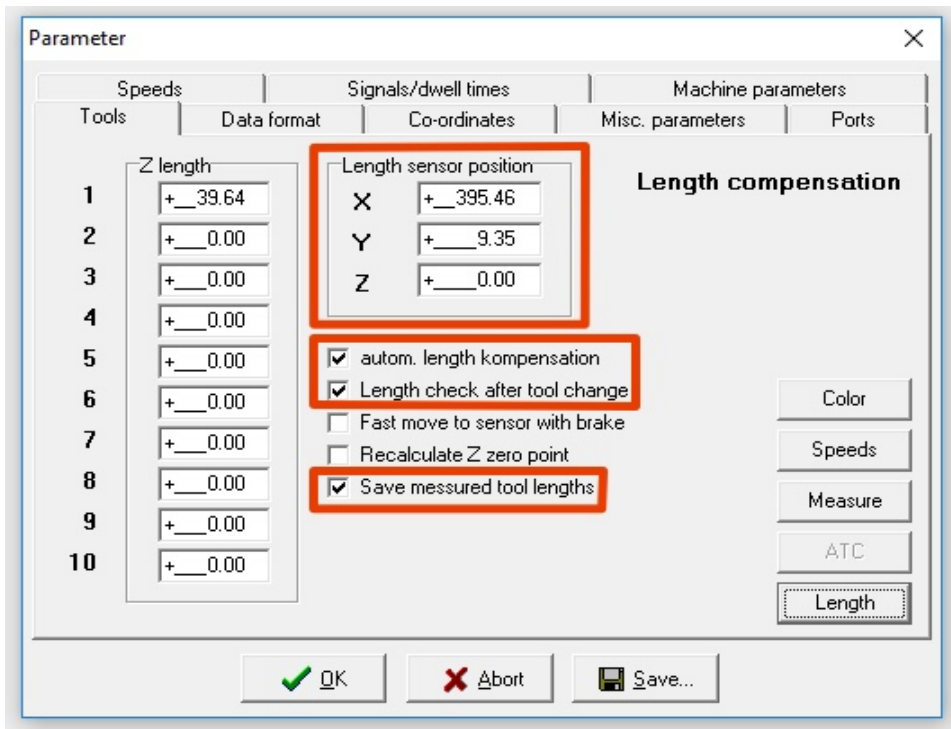
3. Go to "Parameters -> Machine parameters".

Set "Length measurement and compensation".

4. Hit the "Save" button then hit the "OK" button.

5. Exit and restart WinPC-NC.

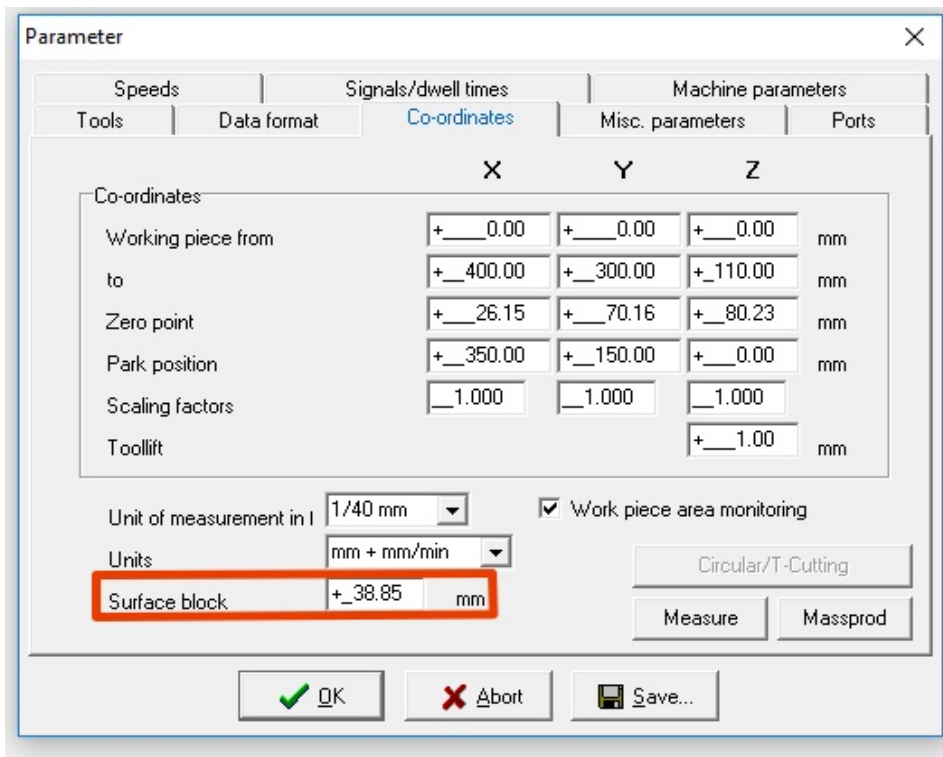6. Inspect the settings to ensure that they are set as intended.

Usage

1. Mount the first tool for the job.

2. Hit the "Select tool" button and select the "1" Length button.

    The tool length will be measured.

3. Position the Tool 100 Length Sensor.

    On the top of your stock for job Z0 on top of the stock.

    On the top of your spoiler for job Z0 on the bottom of the stock.

4. Jog the tool over the center of the Tool 100 Length Sensor.

5. Use "Move to -> Block - zero point Z" to set Z0.

6. Return the Tool 100 Length Sensor to its base.

    Ensure the wire is clear of the cutting area.

7. Load your job and begin.

    Tool length changes will be properly compensated.

Calibrating The Tool 100 Length Sensor

1. Reference the machine.
2. Jog the machine to location that make it easy to work from.
3. Place a piece of MDF (or similar) on the T-slot table under the location selected.
4. Lower the tool tip so it is barely touching the MDF.
    > It is often useful to use a mirror and/or LED light to accomplish this task.
    > Move slowly, using small steps so as to not crash the tool into the MDF.
5. Record the Z value with 2 decimal places. (For example Z = 66.02.)
6. Jog straight up until the spindle as high as it can possibly go.
7. Place the sensor below the tool tip.
    > Move the tool tip down to about 10mm above the center of the sensor.
    > Record the X and Y values without decimals (e.g. X =107, Y = 80).
8. Go to "Parameters -> Tools".
    a) Click on the "Length" button.
    b) Enter the location of the Tool 100 Length Sensor in the "Surface block position" area. Set the Z value to 0.
    c) Check "autom. length kompensation".
    d) Check "Length check after tool change".
   e) Check "Save measured tool lengths".
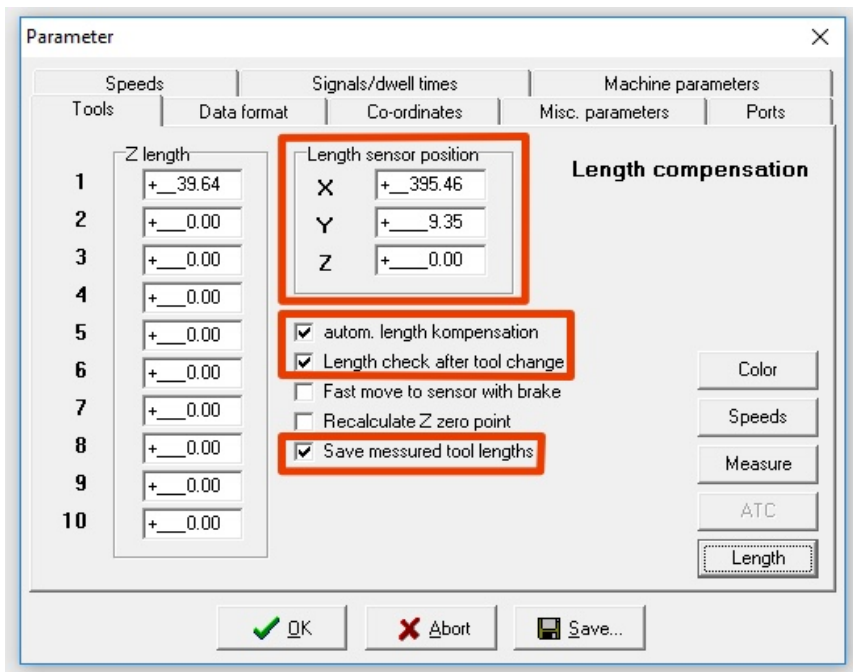
9. Go to "Move -> Select tool" and click on the "1" length button.

    This starts the tool length measurement procedure. The tool slowly descends until it depresses the sensor and then lifts up. Click OK.

10. Go to "Parameters -> Tools".

    Click on the "Length" button. In the Z length list on the left there is the recorded tool length for Tool 1. Record this Z value with 2 decimal places. (For example, 27.97.)

11. Subtract the Z values to obtain the Tool 100 Length Sensor height.

    For instance: 66.02 - 27.97 = 38.85.

12. Go to "Parameters -> Co-ordinates".

    Enter the sensor height in the 'Surface block' entry. (38.05 in this example.)

13. Go to "Parameters -> Machine parameters".

Set "Enable surface block".
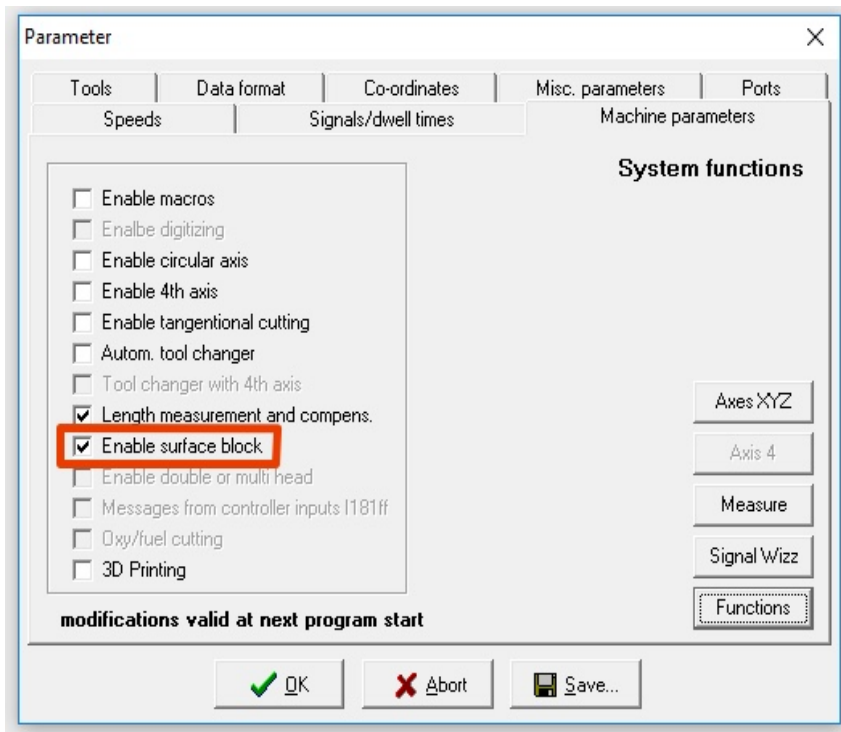
14. Hit the "Save" button then hit the "OK" button.

15. Exit and restart WinPC-NC.

16. Inspect the settings to ensure that they are set as intended.