Translation

CNC-STEP GmbH & Co. KG

Installation and applications
Tool length sensor

For all machine series

Software: KinetiC-NC with CncPOD and 2 LPT-interfaces (V1.56)

https://www.cnc-step.com

From 29.01.2021

Tool length sensor

Short description

This manual shows the connection options for the tool length sensor, the setting up and usage with the software KinetiC NC.

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1 Connectivity

There are many possibilities to connect optional accessories with Neutrik plug (Mini-XLR) such as tool length probe, 3D-pushbutton, start button or door contact switch (on safety enclosures and protective fences) to the machine or to additional hardware.
The corresponding signal pin must be assigned in the software for this purpose.

1.1 XLR-connection directly to the machine

The three machine types High-Z, T-Rex and RaptorX-SL each have an XLR connector (Neutrik)

This input is requested via PIN15 on the LPT1 port.

Attention:

However, this PIN is also required for homing the optional 4th axis (rotary axis, tangential knife, etc.).

Thus, this socket cannot be used in combination with a 4th axis or only to a limited extent!

1.1.1 High-Z-Series

XLR1 - LPT1/PIN15 – active Low

Fig.: XLR connection High-Z

1.1.2 T-Rex-Series

XLR1 - LPT1/PIN15 – active Low

Fig.: XLR connector T-Rex

1.1.3 RaptorX-SL-Series

XLR1 - LPT1/PIN15 – active Low

Fig.: XLR connector Raptor

1.2 XLR connectors on the CncPOD-3XLR (KinetiC-NC)

The KinetiC-NC software is always delivered with the hardware CncPOD.

There are two versions:

Art.-No.:	**3201 0001**	KinetiC-NC control software **without XLR (Standard)**
Art.-No.:	3201 0002	KinetiC-NC control software 3XLR with 3 XLR-connections (Neutrik)

Fig.: CncPOD - connections front side

Fig.: CncPOD 3XLR - Rear connections

XLR1 - LPT2/PIN10 – active Low

XLR2 - LPT2/PIN15 - active Low

XLR3 - LPT2/PIN11 – active Low

1.2.1 Setup KinetiC-NC for CncPOD 3XLR

This version of the CncPOD requires a special configuration in the KinetiC-NC software.

The PIN5 of the LPT2 must be permanently energized (HIGH signal).

To do this, the output O6 - Toogle signal must be "duplicated" to LPT2 PIN5!

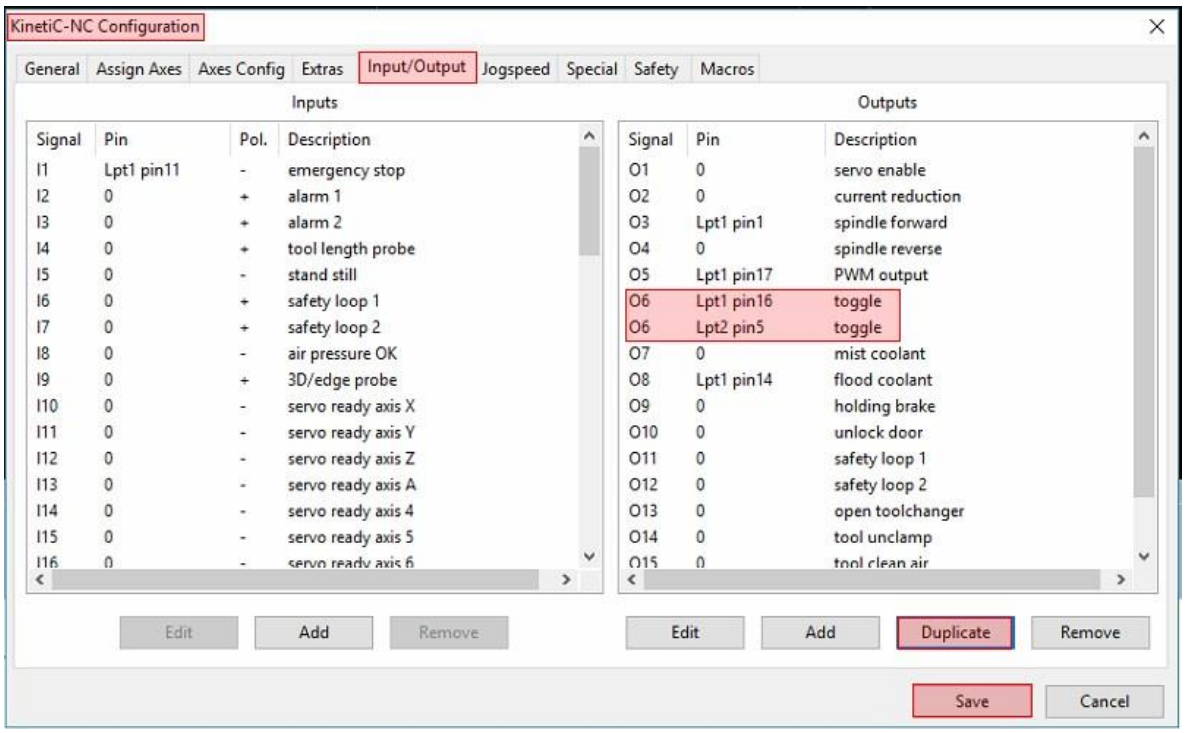


Fig.: Inputs and outputs

The outputs are switched off / reset after an emergency stop or after the inputs and outputs have been configured.

With this configuration, in addition to the Toogle signal, the PIN5 / LPT2 will also immediately turn back on automatically to continue monitoring inputs or alarms on the LPT2.

1.3 XLR Connections of the Mechatron HF spindles

All HF spindle systems from Mechatron have 2 or 3 XLR connectors (Neutrik)

1.3.1 Cabinets without Pneumatics

Fig.: Control cabinet HFS (AC) -6508-24

XLR1 - LPT2/PIN10

XLR2 - LPT2/PIN15

Fig.: Control cabinet HFS (AC) -8022-24

XLR1 - LPT2/PIN10

XLR2 - LPT2/PIN15

XLR3 - LPT2/PIN11

1.3.2 Cabinets with Pneumatics

Fig.: Control cabinet ATC-8022-42

XLR1 - LPT2/PIN10

XLR2 - LPT2/PIN15

XLR3 - LPT2/PIN11

2 Set up the input pin of the sensor in KinetiC-NC

Depending on which port is connected to the tool length sensor, the input pin in the software has to be assigned.

In the standard file for the tool length sensor the connection is set up directly on the machine.

2.1 Load standard parameters

The standard parameters for the tool length sensor can be loaded as follows.

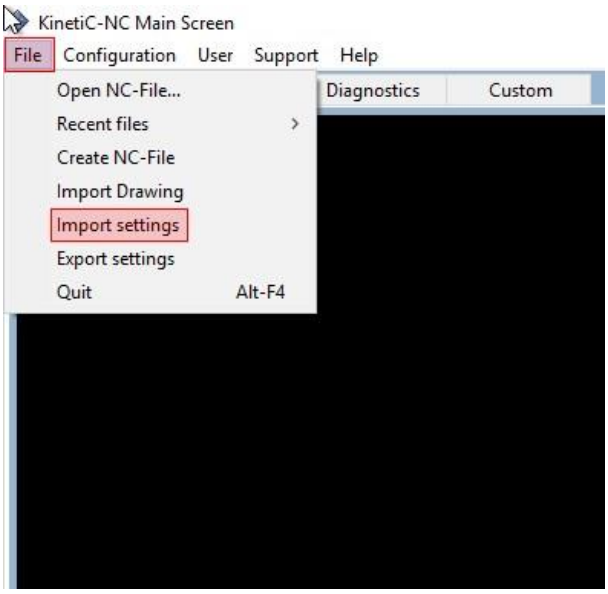


Fig.: Menu - file

Under "File" you can import the settings.

The file "Tool-Length-Sensor.ini" is located under Defaults / Addons.

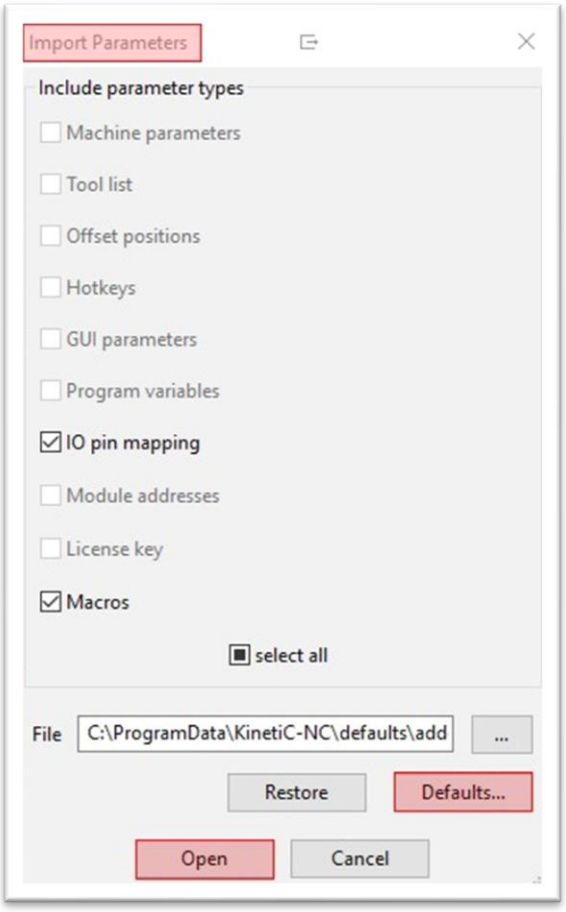


Fig.: import Parameters

The necessary macros and the pin assignment for direct connection to the machine are automatically loaded for the tool length sensor.

2.1.1 Change the PIN assignment

If the tool length sensor is not connected directly to the machine but to one of the other input sockets (see chapter 1), the input pin must be adjusted accordingly in the configuration of the software.

Attention: The standard file still must be loaded before (chapter 2.1)

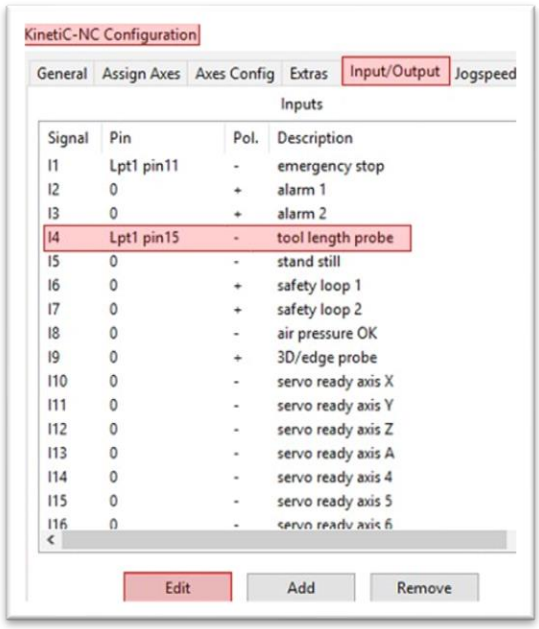


Fig.: Select input

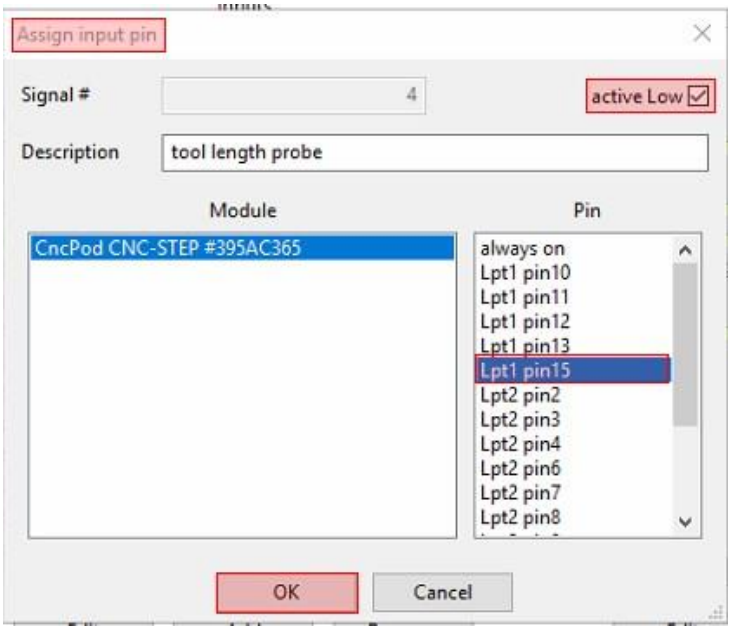


Fig.: assign input pin

To do this, open the KinetiC-NC configuration and go to the "Inputs / Outputs" tab.

The signal input "I4" for the tool length probe can now be marked and changed.

In the window "Assign input pin" the correct PIN can now be selected (see chapter 1). Pay attention to the correct inversion (active Low).

2.2 Functional test

In any case, you should now check the function of the tool length sensor.

Go to the program tab "Diagnostics". There the tool length sensor is now listed in inputs with a marked box. In the normal state (inactivated), no check mark may be displayed in the box.

When pressing the button, the checkmark should be visible.

If the it is exactly the opposite case, the entry must be changed to "low-active". This inverts the signal.

3 Determination Hight (Z0) of the workpiece surface

To determine the workpiece surface "Z0", the tool length sensor can be used on a mobile basis. The button is removed from the mounting plate and placed directly on the workpiece or material surface.
This contrasts with the direct "scratching" of the workpiece surface or
"Paper method" considerably easier.

3.1 Select workpiece offset

Before the Z0 can be determined, the desired workpiece offset (for example G54) must be selected !!!

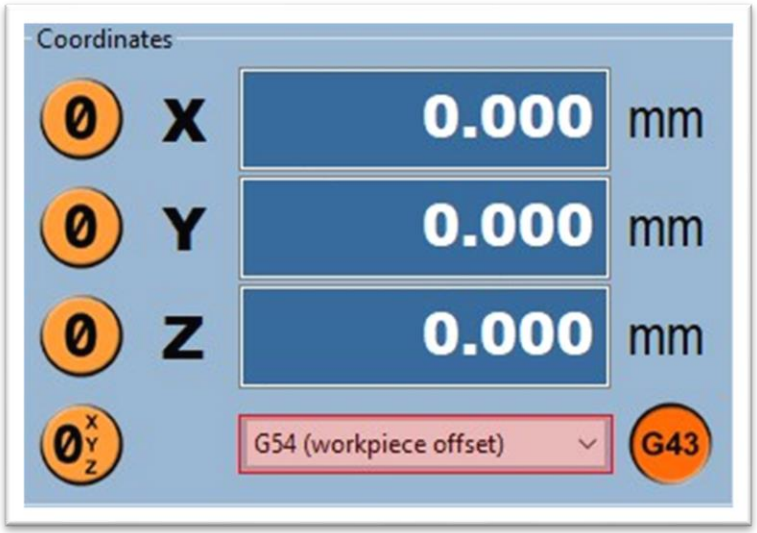


Fig.: select workpiece offset

This can be selected in all program areas.

3.2 Determination of the sensor Hight (once)

To determine the workpiece surface via the tool length sensor, the exact sensor dimension should be identified and registered in the macro parameters, see # 953.

To determine the exact length of the tool length sensor, the height of the sensor must be measured in advance by means of a calliper gauge. From the measured value, subtract 5mm (for example, measured sensor height about 39,20mm = entry 34,20mm).
The exact dimension is determined only by the first measurement process!

Now mark the parameter # 953 and enter the determined value in the input box (under the parameters).

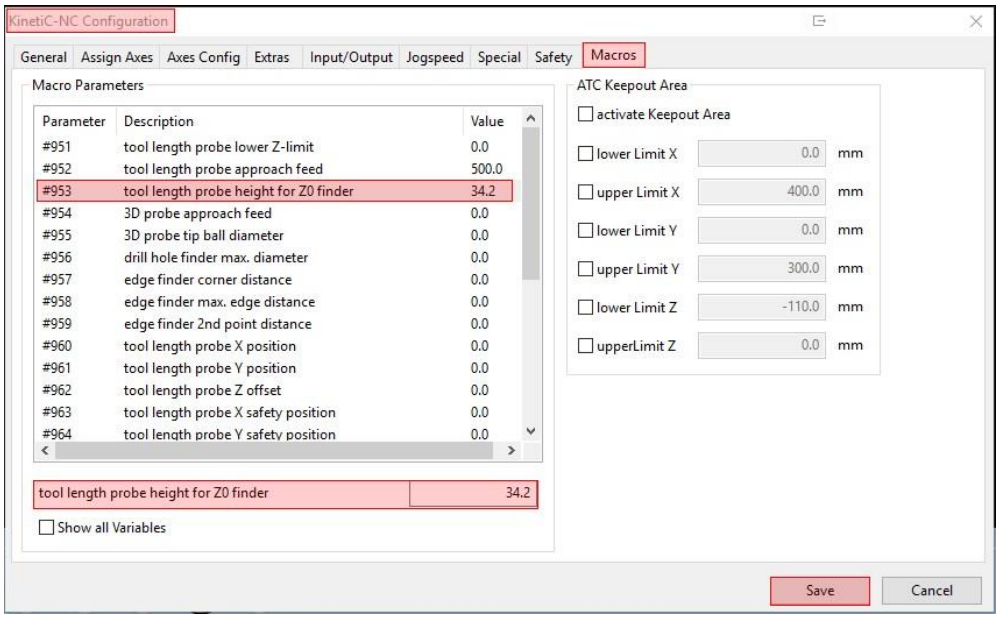


Fig.: Macro parameters

To determine the workpiece surface, position the tool length sensor on the material and drive the machine centrally over the sensor.

Now the first measuring process can be done via the macro "Z0-Finder".

3.2.1 Macro Z0-Finder

Under the tab "Custom" you will find the user macros.
Here, the macro "Z0 Finder" will be performed by a double click. The tool moves slowly on the sensor until the switching point is reached. The height of the sensor (parameter # 953) is subtracted from the position reached, and the result is stored as the Z coordinate of the selected workpiece offset (e.g., G54). Thus, after that, the coordinate zero point is located exactly on the workpiece surface.

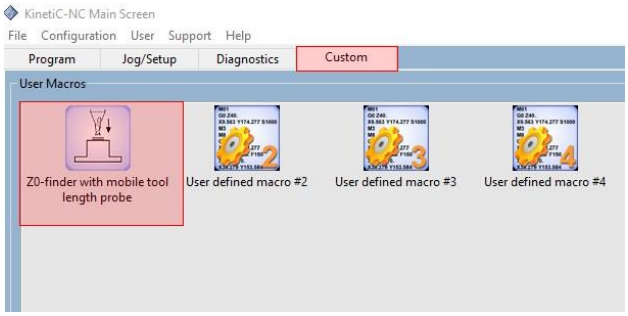


Fig.: User macros

Adjustment of the sensor dimension after the first measurement!
Since we have not specified an exact value for the sensor height in the first step, we now have to scratch the workpiece surface once, manually, or, for example, use the paper method. The difference value must now be calculated with the entered value under parameter # 953.

Practical example:
We have measured with the calliper a sensor height of 39,20mm. For the meantime, we have entered **34,20mm** in parameter # 953. After executing the "Z0-Finder" macro, the machine is still approx. 5mm above the material after driving on Z0.
We now go down manually with the Z-axis and scratch the workpiece surface. We remember the displayed Z value in the Kinetic-NC coordinate window (e.g., Z = -5,05mm). The value we still had to drive down to scratch the workpiece surface is added to the already entered value in the macro parameters under # 953.This results in the exact height of the tool length sensor of 34,20mm + 5.05mm = **39.25mm**. This value is now entered in the macro parameters under # 953. The setup is now complete, and the tool surface can now be determined as described by running this macro.

3.3 Determine workpiece surface Z0

Once the probe height has been determined, the material surface can now be easily determined using the macro Z0-Finder.

For this purpose, the steps already described must be carried out.

- Select workpiece offset (G54 .. G59) - see chapter 3.1
- If required, switch on the tool length compensation G43 (only necessary when using several tools in the milling job) - see chapter 4.1
- Place the length sensor on the material surface
- Drive the machine over the centre of the sensor
- Run macro Z0-Finder – see chapter 3.2.1

4 Working with several tools in the program

If you want to work with several tools in one program run, the tool length compensation must be switched on. Thus, the tool length can be determined with the tool length sensor and the different tool lengths are automatically considered in the program sequence.

4.1 Tool length compensation (G43)

The tool length compensation (G43) is turned on by clicking the button G43 / G 49. By default, this is off (G49). The set mode is displayed on the button!

Attention: G43 must be switched on before tool measurement and before setting Z0!

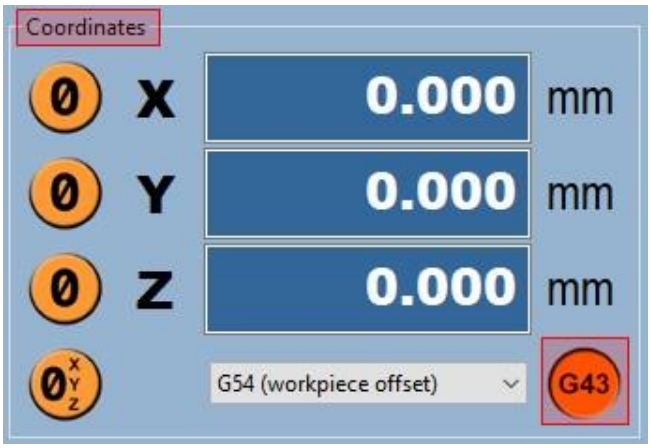


Fig.: Selecting tool length compensation

By clicking on the button G43 / G49

in the coordinate window

you can switch between the two modes

4.2 Set up tool length sensor

In addition to selecting the correct input pin for the sensor (see Chapter 2), the sensor must be mounted in a fixed position and some important parameters must be determined and entered.

The position of the tool length sensor should be selected so that it is not in the way for the upcoming work. The location of the tool length sensor can also be protected against accidental collision.

For this purpose, a "prohibited area" can be defined in the software. This area then appears as a red box (wireframe) in the graphic display and can no longer be navigated with the manual movement (jog) or travel commands in the (main) program. The movement stops in this case from entering the forbidden area and a corresponding message appears. Only via macros, such as for the tool change or the length measurement, the protection area can be travelled. The settings for the "prohibited area" can be found to the right of the macro parameters. (see screenshot on the next page)

Further information can be found in the reference manual.

4.2.1 Mounting the tool length sensor

Attach the holding plate of the tool length sensor at the selected location.

The sensor itself holds magnetically on this plate and can be easily removed when not in use or when used as a mobile Z0 sensor.

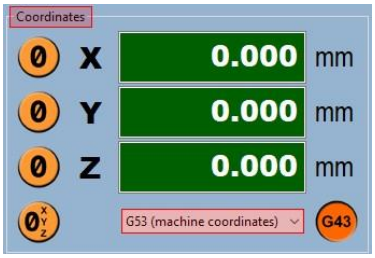
Fig.: Retaining plate WLT

4.2.2 Setting parameters for the tool length sensor

In the macro parameters marked parameter values are entered. These will be described in more detail below.

For this purpose, the desired parameter must be marked, and in the lower window, the input of the determined values takes place.

Important: All determined values refer to the machine coordinates (G53) !!!



Check if G53 is selected!

Only then the machine coordinates are displayed.

Fig.: check Offset G53

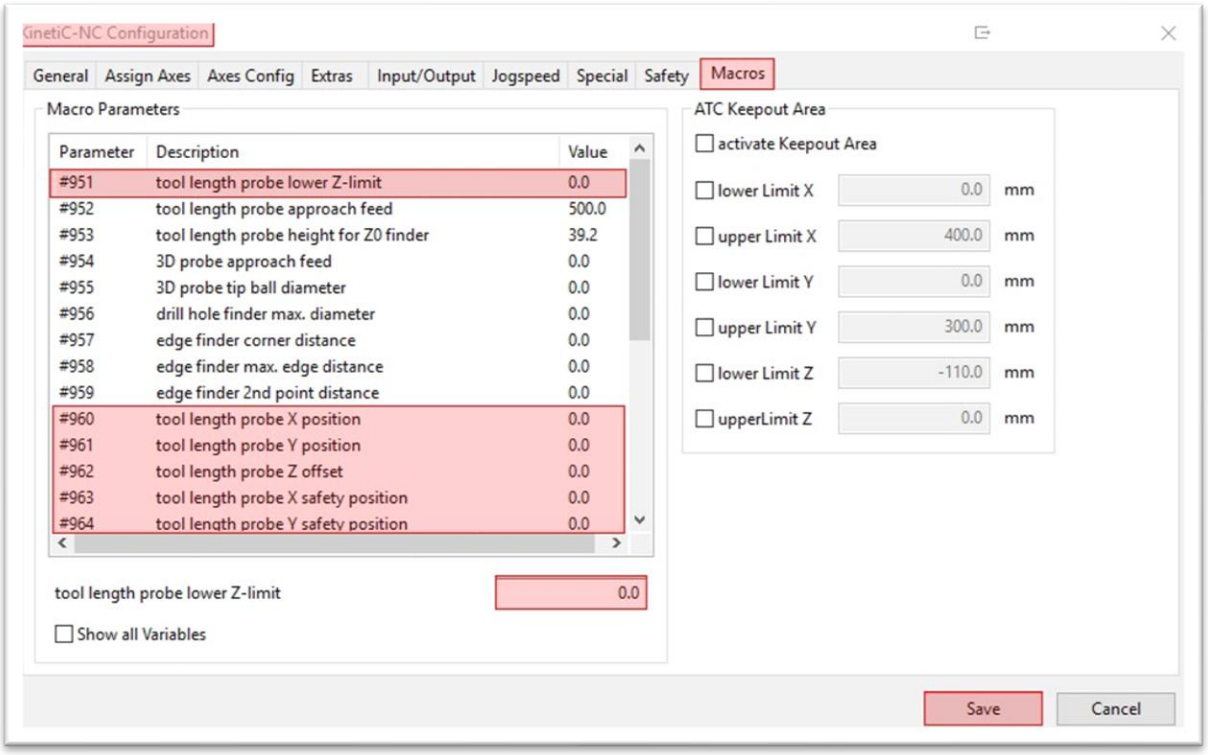


Fig.: Macro parameters for tool length sensor and prohibited area

Enter the determined values at the bottom of the window after selecting the parameter.

Note: On the right side, the location of the length sensor can be selected to protect it from collision. (prohibited area)

#951 Tool length sensor lowest position

For this you move the spindle (no tools required) just above the tool length sensor. The determined Z-value is entered here.

Fig.: Z lowest position

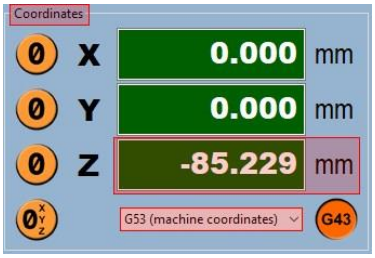


Fig.: read z-value

This parameter ensures that you cannot accidentally drive the spindle into the sensor and damage it when no tool is clamped for measuring

#960 Tool length sensor X-Position

#961 Tool length sensor Y-Position

For this, the spindle is cantered over the tool length sensor. The determined X and Y values are entered here accordingly.

#962 Tool length sensor Offset Z-axis

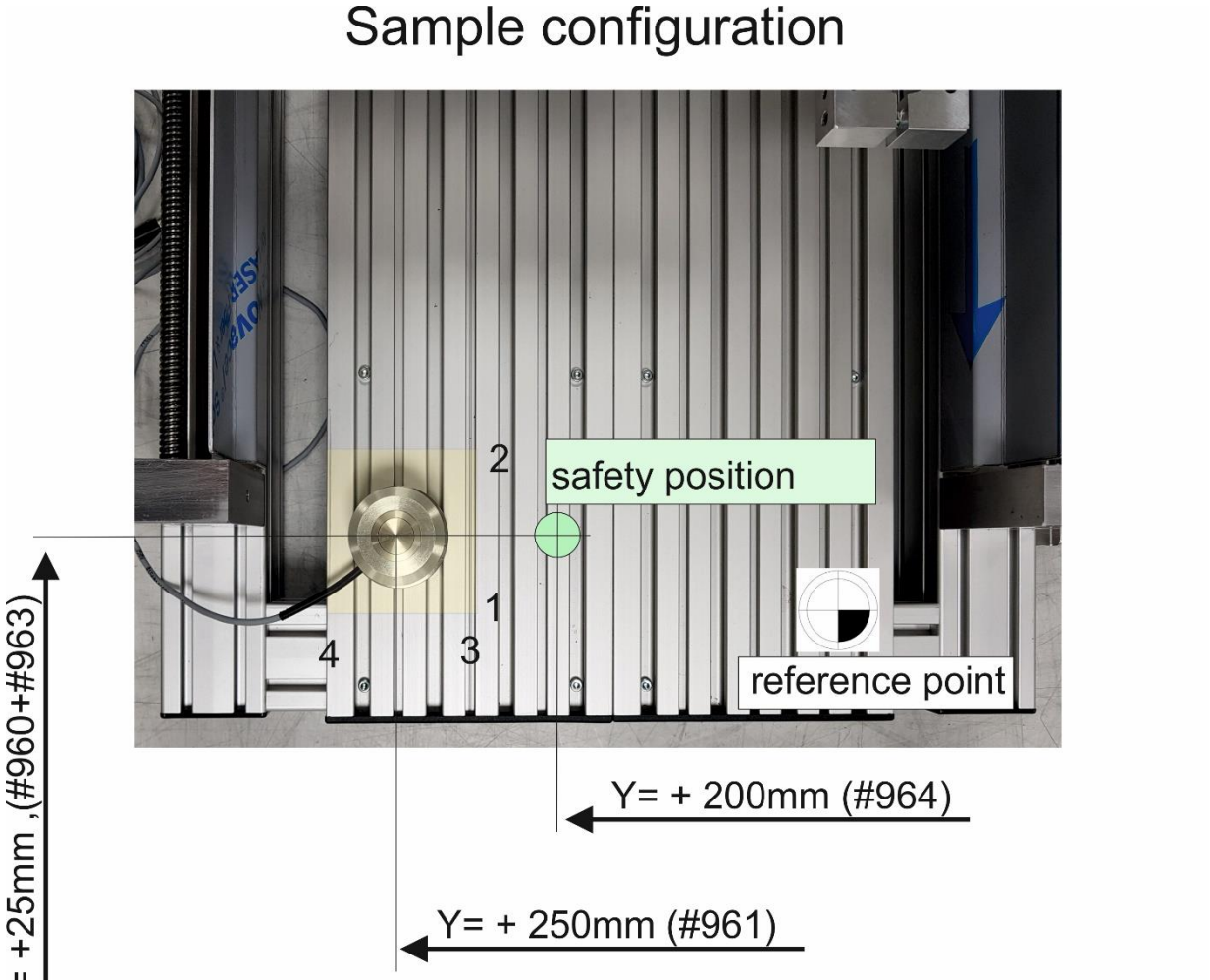
The value for the determined and stored length of the tool depends on the height position (Z) of the mounted tool length sensor. Thus, it can happen that negative tool lengths are stored. By entering the offset, the tool length is corrected to the correct length. The offset must be determined once during the first measurement:
The length of the clamped tool is measured manually.
(e.g., tool bottom to collet) - e.g. 30mm
After the first measurement (see chapter 4.3.1), the difference to the displayed measured value is calculated in the message window (e.g. -110mm) and entered here. (in this example from -110 to +30 = 140mm)
At the next measurement, the actual tool length of 30mm will be displayed.

#963 Tool length sensor safety position X

#964 Tool length sensor safety position Y

Here, the position is indicated where the machine goes after the measuring process. The machine should not be left over the sensor after the measuring process in order to avoid a collision during program start.
If a "prohibited area" is defined to protect the sensor, the position must be outside this protected area.

4.2.3 Example configuration with "prohibited area



Keepout Area

1: lower Limit X = 0mm
2: upper Limit X =+50mm
3: lower Limit Y =+225mm
4: upper Limit Y =+275mm

lower Limit Z = -25mm
upper Limit Z = 0mm

With these values you could still drive over the tool length probe, but only from Z0 to Z-25 and not deeper!

4.3 Changing tools and measuring the tool length

Once set up, the automatic tool length measurement can be started.

4.3.1 Manual tool change and length measurement - manually started via "Change tool “-

Fig.: changing tool

The current tool is displayed on the left.

In this case Tool 1!

Via the button "change tool" you get to the corresponding window.

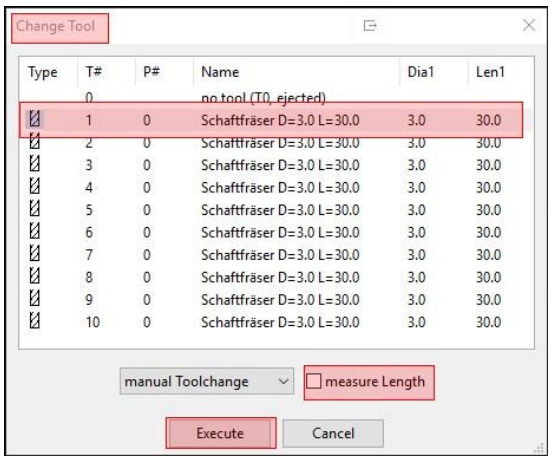


Fig.: Select tool and length measurement

The required tool can be selected here.

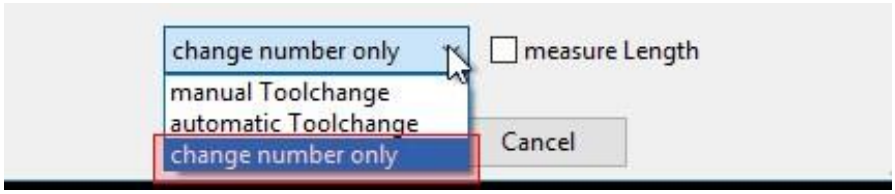
If the tool is to be measured directly, the checkmark must be set to "measure Length".

Then click "Execute".

If the selected tool is already clamped, the tool measurement will be started directly!

You can also specify the clamped tool directly at this point if it does not match the display.

It could e.g. occur that in the tool window no tool (-) is displayed, but tool 1 is loaded. (was manually changed, not changed via the software)



To do this, select "Change number only" in the drop-down window and click on "Run".

After the measuring process, the measured tool length is displayed in the message window and entered in the tool list.

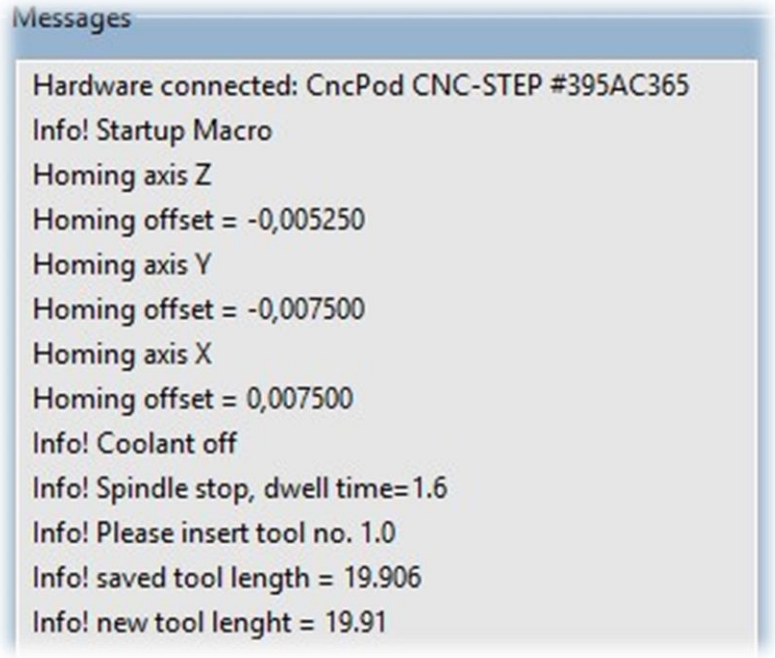


Fig.: Message window

4.3.2 Manual tool change and length measurement

- from the milling program -

If the tool change is invoked directly via the G-code of the milling program, no automatic tool length measurement is normally performed.

If desired, at the end of the macro, the tool measurement command (G79) for the manual tool change (M66), can be set.

In this case, a tool length measurement is automatically performed after every tool change.

We are happy to help you with the implementation. Please contact our support team.

5 Customer service

For technical information please contact our customer service:

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If you have any questions, please contact our customer service by e-mail or telephone. We are happy to help.

Numerous suggestions and information can also be found on our website:

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