CNC-Trainer

14000-99

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Fig. 1: 14000-99 CNC-Trainer

Operating instructions

CE The unit complies with the applicable EC-guidelines

TABLE OF CONTENTS

1 SAFETY PRECAUTIONS

Caution!

- Read the operating instructions carefully and thoroughly before using the device. This will protect you and prevent damage to your device.
- Do not use the device if it shows signs of damage
- Only use the device for its intended purpose.
- Do not open the device.
- Protect the device from dust, moisture and vapours. Only clean the device when it is disconnected from the mains.
- Do not switch on the device if you suspect faults in the device or a connected milling machine, or if there is obvious damage.
- **It is essential to observe the operating instructions and safety instructions provided by the manufacturer of the milling machine used.**
- Do not switch on the device if you suspect faults in the device or a connected milling machine, or if there is obvious damage.
- The emergency stop button on the device only stops the production process; it does not interrupt the power supply to the milling machine. Use the emergency stop button on the milling machine for this purpose.

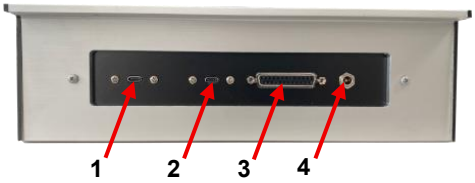
Definition of symbols used	
	Caution! Risk of danger. Observe the operating instructions
	Complies with relevant European directives
	Old appliances must be disposed of separately from household waste
	Class II appliance with functional earthing

2 PURPOSE AND CHARACTERISTICS

The CNC Trainer control panel is the interface between the CAD/CAM programme, digital twin and CNC milling machine. It enables the virtual or real milling process to be started and stopped, the axes to be moved manually using a joystick and rotary wheel, and the spindle motor to be configured. The integrated display provides an overview of the current coordinates of the milling head as well as its current feed rate and spindle speed. The milling process can be stopped immediately and safely at any time using the emergency stop switch.

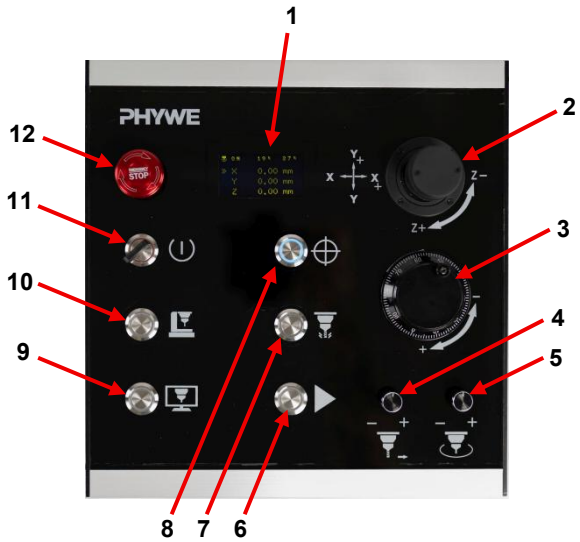
3 FUNCTIONAL AND OPERATING ELEMENTS

3.1 Connections

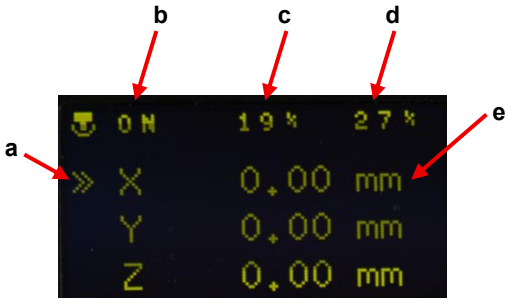


1. USB connection to the PC running the ‘Estlcam’ CNC control software.
2. USB connection to the PC running the ‘CNC-Trainer’ simulation software.
3. 25-pin D-SUB socket for connecting the CNC machine.
4. Power connection. (12V min. 1A, internal +)

3.2 Controls



1. Display



   a. Indication of which axis is currently being moved. This information is required for fine movement using the rotary knob (control element 3). The selected axis is finely adjusted using the rotary knob.
   b. Spindle status display. ON = spindle is switched on, OFF = spindle is switched off.
   c. Feed rate status display (control element 4)
   d. Spindle speed status display (control element 5)
   e. Coordinate display

2. Joystick for fast movement in the X, Y and Z directions.
3. Handwheel for very fine movement in the X, Y and Z directions. Care must be taken to ensure that the correct axis is active (display no. 1). This is specified by moving the joystick in the corresponding direction.
4. Feed rate adjustment (0…100%).
5. Spindle speed adjustment (0…200%).
6. Start and stop CNC programme.
7. Start and stop spindle.

Caution: Only start the spindle if it can rotate freely and there are no persons or objects in the vicinity. Observe the safety instructions provided by the milling machine manufacturer.

8. Set zero point. Pressing the button for longer than 2 seconds resets the currently active axis (display no. 1). Pressing the button a second time for longer than 2 seconds resets the remaining axes.
9. Switch simulation on and off. If the simulation is switched off, no data is output via the USB interface.
10. Switching the CNC milling machine on and off.

Caution: Only start the milling machine when all milling paths are clear and no persons are in the vicinity of the milling machine. Observe the safety instructions provided by the manufacturer of the milling machine.

11. Key switch for switching the device on and off. Key position left = off, key position right = on.
12. Emergency stop for immediately stopping the CNC programme.

When the emergency stop is pressed, you can continue operating the joystick..

4 HANDLING

4.1 Installation and configuration of the software

The ‘Estlcam’ software is used as the control software for the CNC machine.
Download the latest version of the installation software from https://www.estlcam.de/ and install the programme on your Windows computer. Two individual programmes will be created on the computer.
Estlcam Vxx CAM:

- This is the CAM (Computer-Aided Manufacturing) programme for creating CNC programmes from drawings (DXF or SVG format). Instructions and help for the programme can be found on the website https://www.estlcam.de/.

Estlcam Vxx CNC:

- This is the control software for the CNC milling machine, the setup of which is described below.

Help and descriptions can also be found on the website https://www.estlcam.de/ and in various videos.

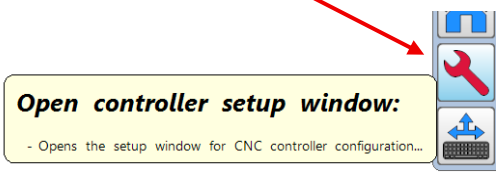
4.2 Setup the Language

Start Estlcam Vxx CAM Software. The select Set-up/Basic Settings for changing the language.

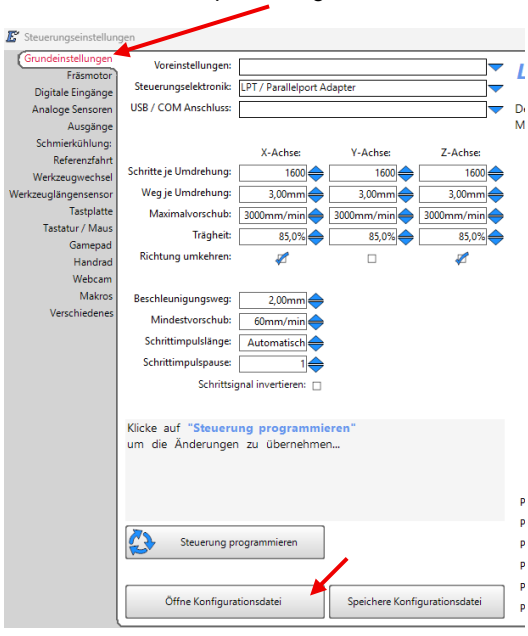
4.3 Set up CNC control software for use with the CNC milling machine control panel

4.3.1 Automatic setup via configuration file

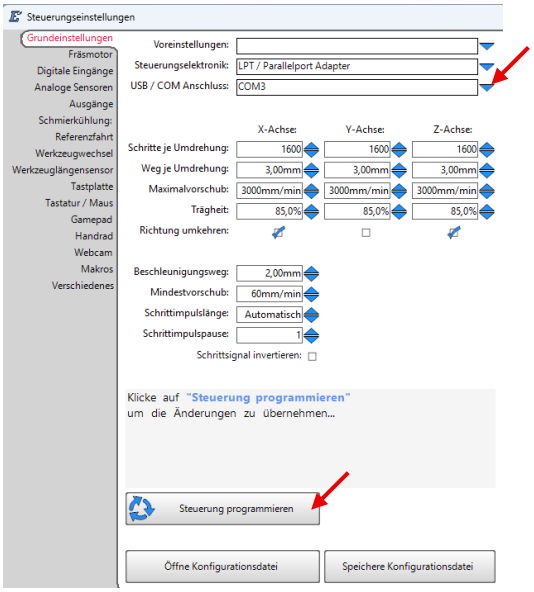
Use the configuration file. You can find this in the download area for the CNC Trainer 14000-99 at https://www.phywe.de/
Start the Estlcam CNC software and click on the settings icon in the right-hand toolbar:



Now click on the ‘Basic settings’ tab in the settings window and then click on ‘Open configuration file’.



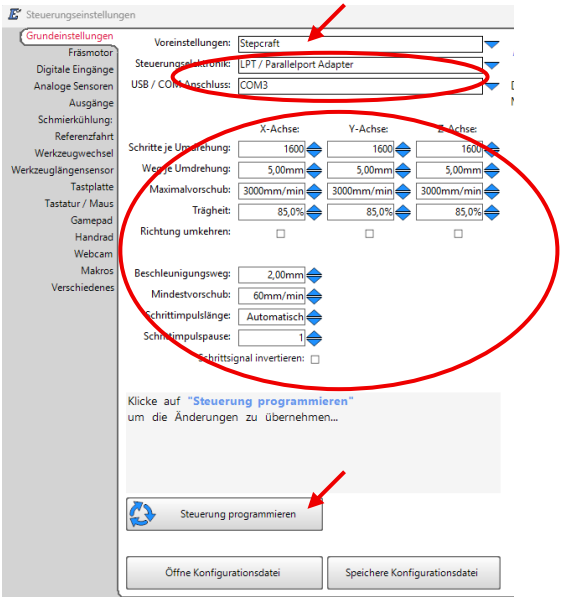
Select the configuration file you downloaded earlier and open it. Now, all the necessary settings described in the manual configuration below will be made.
You only need to select the USB COM port to which the control panel is connected to the PC (see connection 1) and then program the control system.



After successful programming, the control system restarts automatically. Furthermore, the additional handwheel module (control panel) must be recognised.

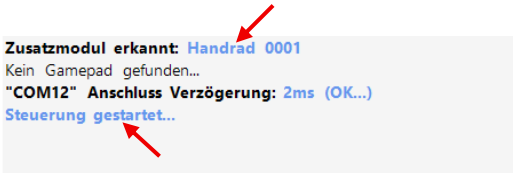
4.3.2 Manual setup

Select the default setting for ‘Stepcraft’ in the basic settings and check the machine parameters you have now set against the technical data for the CNC machine.
Then select ‘LPT/Parallel Port Adapter’ as the control electronics and set the COM port to which the control panel is connected (Nr 1 at Chapter 3.1).



Then click on ‘Programme control’.

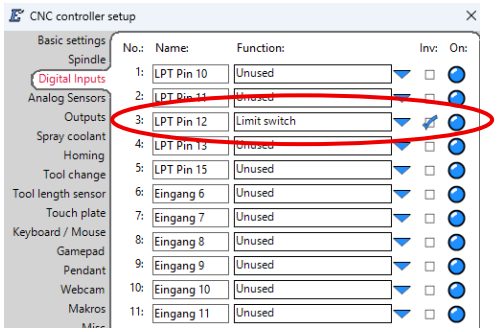
After successful programming, the control will restart automatically. The additional handwheel module (control panel) must also be recognised.



Activate the limit switches to prevent collisions with the end stops and to perform the reference run (see section 4.3.2).

Caution: If the limit switches are not actively switched, damage to the CNC machine may occur.

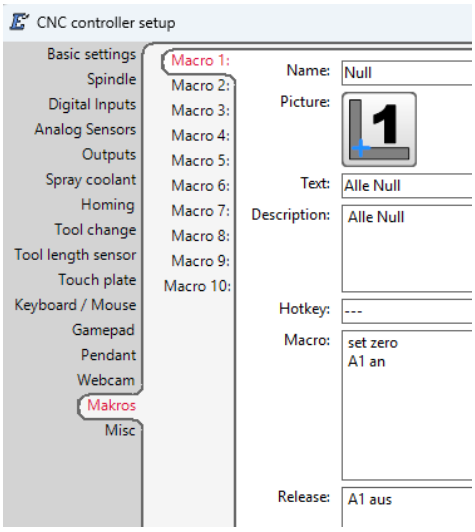
To do this, click on the ‘Digital Inputs’ tab in the control settings and select ‘Limit switch’ under No. 3 (LPT Pin 12). Continue by clicking the ‘Inv’ checkbox to invert the signal.



Then set the following macro. It is used to create a switch at the bottom right of the Estlcam software with which all axes can be set to 0 and the information transferred to the control panel display.

To do this, select the ‘Macros’ tab in the settings window and select Macro 1 here:

Name:	Any selectable (e.g. ‘zero’)
Picture:	See below. Or freely selectable.
Text:	Text is displayed when the switch is selected. E.g. ‘All zero’.
Description:	Freely selectable
Macro:	Executed when the button is pressed – Enter ‘set zero’ and ‘A1 on’.
Released:	Executed when the button is released – enter ‘A1 off’.



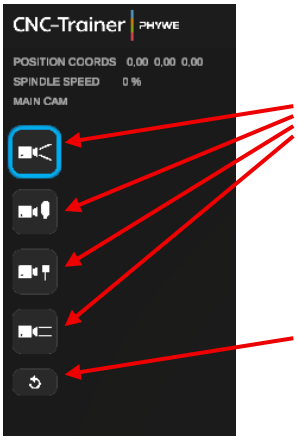
4.4 Using the CNC Trainer software

The software is used to simulate a CNC machine in its entirety. Before milling data (g-code) is sent to a real milling machine, the setup of the milling machine and the milling process can be simulated. The milling result can be viewed in detail.

After starting the software, an image of the milling machine appears in the centre of the screen. Various controls are located to the right and left of this image.

4.4.1 Controls

Informations and camera position:

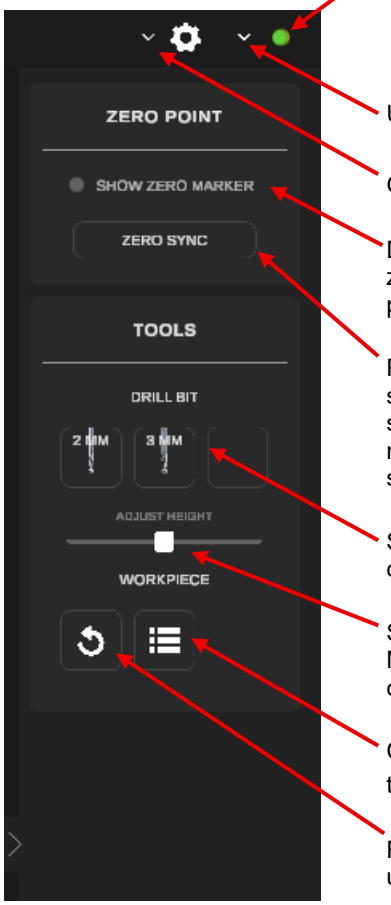


Various standard camera positions (button ‘c’)

Resetting the camera position to default (button ‘v’)

By clicking on the milling cutter and moving the mouse, the camera position can be changed at any time.

Adjustment options:



Connection status to the CNC control
- Connection OK
- No connection

USB settings ❶

General settings ❷

Display the current device zero point as a coordinate pointer.

Perform zero point synchronisation. Used to synchronise the real milling machine and the simulation.

Select the used Milling cutter.

Set the length of the Milling cutter or the clamping depth.

Change the properties of the workpiece. ❸

Reset the workpiece to its unused state.

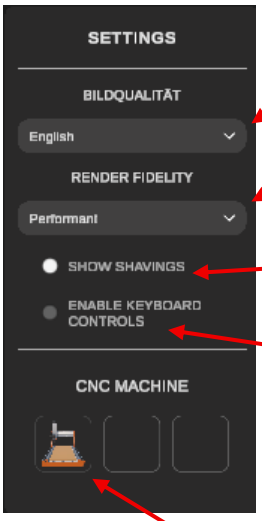
❶ USB settings

Clicking on the arrow icon opens the settings window for selecting a USB port and establishing a connection.

In USB PORT SETUP, select the USB port that is connected to the USB socket (section 3.1 No. 2). Then click on 'CONNECT'.

The connection must be shown in green in STATUS. Only then is the connection correct.

❷ General settings



Select language

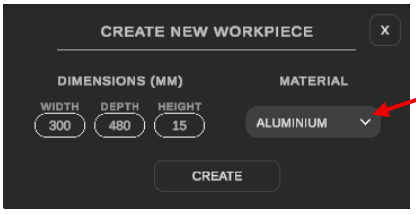
Select simulation detail level depending on PC performance.

Activate detailed milling process (chip flight)

Activate simulation via keyboard keys:
a = X-axis negative (left)
d = X-axis positive (right)
s = Y-axis negative (front)
w = Y-axis positive (rear)
e = Z-axis negative (down)
q = Z-axis positive (up)

Select the CNC portal milling machine to be used.

❸ Change the properties of the workpiece



Selection of workpiece material

Enter the dimensions and material of the workpiece here. Then click on CREATE.

4.4.2 Synchronise the CNC machine with the CNC Trainer software

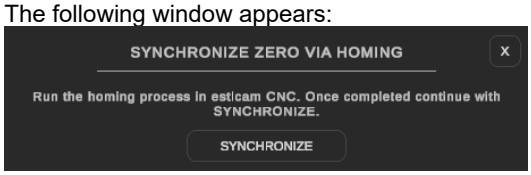
With the help of zero point synchronisation, you can align the coordinates of the real CNC machine with the simulation.

Synchronisation is essential if the connected CNC machine is to be operated simultaneously with the simulation in the CNC Trainer software. (Parallel operation – Chapter 3.2 No. 9+10 pressed)

To synchronise the X-Y-Z coordinates of a connected CNC machine with the CNC-Trainer software, proceed as follows:

1. K In the CNC Trainer software, click on ZERO POINT SYC.

   The following window appears:



2. Move the CNC milling machine to its home position using the Estlcam CNC software with the help of the reference run. To do this, click on the icon: 

   The limit switches on the machine must be activated. See section 4.2.2.

3. Once the home position has been reached, click SYNCHRONISE in the CNC-Trainer software.
   The coordinates in the software now match the coordinates of the machine.
   Only the cutter length (clamping depth) may need to be adjusted in the CNC-Trainer software (Settings - ADJUST HEIGHT).

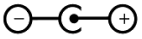
5 NOTES ON OPERATION

This high-quality device meets the technical requirements set out in the current European Community directives. The product features qualify it for CE marking.

.This device may only be operated under expert supervision in a controlled electromagnetic environment at research, teaching and training facilities (schools, universities, institutes and laboratories).This means that radio transmitting devices such as mobile phones may not be used in the immediate vicinity of such an environment.The individual connected cables must not be longer than 2 m. Electrostatic charges or similar electromagnetic phenomena (HF, bursts, indirect lightning discharges, etc.) can affect the device, causing it to no longer operate within the specified data.The following measures reduce or eliminate the disruptive influence: avoid carpeted floors; ensure potential equalisation; experiment on a conductive, earthed surface; use shielding and shielded cables. Do not operate high-frequency transmitters (radio equipment, mobile phones) in the immediate vicinity.

6 TECHNICAL DATA

Operating temperature range: 5 - 40°C
Rel. humidity < 80%

Supply voltage:	12V 1A 
Housing dimensions (WxHxD)	191x240x107 mm
Weight including power supply	3,5 kg

7 SCOPE OF DELIVERY

The scope of delivery includes:

- Control panel including power supply 14000-99
- 2x USB-C connection cable
- Simulation software „CNC-Trainer“
- Operating manual

8 ACCESSORIES

- CNC milling machine D420, Stepcraft 14005-99
- HF precision spindle, Stepcraft 14005-01
- Parallel-Module OEM package, Stepcraft 14005-03
- Spannzange ER11, Stepcraft 14005-02
- Estlcam Software license

9 DISPOSAL

The packaging consists mainly of environmentally friendly materials that should be disposed of at local recycling centres.

Do not dispose of this product with normal household waste. If this unit needs to be disposed of, please return it to the address that is stated below for proper disposal

PHYWE Systeme GmbH & Co. KG
Department Customer Service
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D-37079 Göttingen

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Fax +49 (0) 551 604-107

10 LICENCE INFORMATION

The product contains software components that are licensed by the copyright holders as free software or open source software.

The following components are used:

U8g2lib	New BSD License https://opensource.org/license/BSD-2-Clause
TwoWire	GNU Lesser General Public License https://opensource.org/license/lgpl-2-1