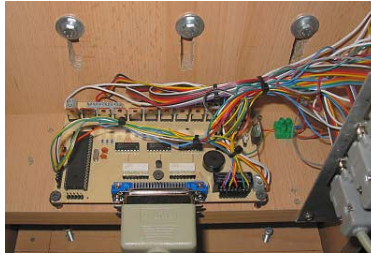


## Mounting prescriptions:

### PCB V4.1



To get a stable and error-free operation some mounting prescriptions must be observed!

#### Supply voltages:

The negative terminal of the power supply of digital circuits and that of the power supply of the motors (GND) can be strapped only on the PCB. The supply current of the motors cannot flow through the ground terminal (GND) of the power supply of the digital circuits!

The power supply of the motors and that of the Mill (milling motor, filament) must be protected by fuses (Wickmann type) before the PCB!

The AC voltage for both the power supply for the stepping motors and that of for the digital circuits must be provided by a safety transformer according to the MSZ 172/1 standard!



Origin Power Supply

#### Power supply for the digital circuits:

The input voltage, that must be filtered by a capacitor of minimum 1000  $\mu\text{F}$ , can be between +8V és +12V. The maximum load of the digital part is approximately 150 mA. This voltage must come from a transformer that is independent from the transformer of the motor power supply, or at least from an independent coil!

It is better to use lower input voltage, - about + 8 V, - as there is no need in that case for heat sink for the stabilizer IC of + 5V (above +12V it gets warm, and its cooling may be necessary).

#### Power supplies for the motors:

Stabilization is not necessary but filtering by capacitors is a must. All the current load must be taken into account, and a capacity of 1000  $\mu\text{F}$  should be encountered for a load of 1A.

Care must be taken that the unloaded motor-voltage should not exceed the maximum allowed voltage (50 V, or 90 V DC in case of elevated voltage version)!

Care should be taken of section and joints of feeding (because of high currents).

High-current wires should not be guided close to the controller circuit.

#### Cooling of FETs :

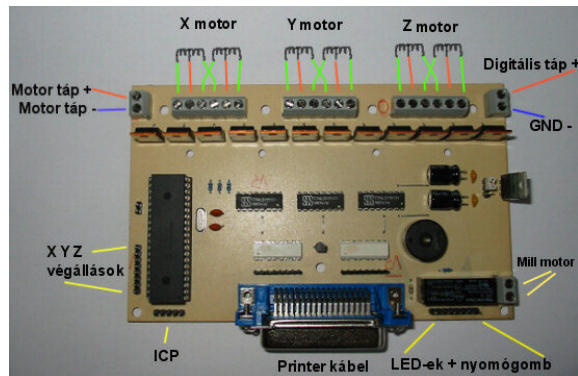
Cooling is not necessary up to a load of maximum 2.5A/phase! If the load exceeds this value, cooling is necessary.

As heat sink, aluminium plates fixed to FETs can be used or 2 pieces of special heat sink with great heat-dissipation, which optionally can be ordered, can also be applied.

All the FETs must be insulated from the heat sink!

The FETs must be fixed by screws to the 2 pieces of heat sinks, which can be optionally ordered. Their insulation is necessary. The heat sink is fixed from the bottom of the PCB by plastic screws through the specially formed borings (4 pieces).

### Mounting of the PCB:



(This is screen older version V3.2)



(in-case-built-in)

The PCB must be mounted possibly through all the mounting bores. It is necessary to place insulating (e.g. made of plastic) underplates above the metal distance pieces, between the PCB and distance pieces! In the course of mounting the PCB should not be bent.

In the course of tightening the bolt joints the move of terminals should be prevented (so that it could not be twisted)!

### Putting the unit into operation:

Check if polarity of terminals of the power supplies (power supply for the digital circuits and for motors) is correct.

At first the PIC mustn't be in its case, motors should not be connected, and power supply for the motors should be turned off (+8...50V or +8...90V)!

By these conditions and with the power supply for the digital circuits on, Vcc (+ 5V) and its polarity should be checked at the pins of PIC (see schematics!)

Following that turn on the power supply for the motors and check the value and polarity of the voltage between CON18 or CON 21 or CON27 or CON30 or CON33 positive and CON35 terminals.

Then turn off the motor supply and connect CON18, CON21, CON24, CON27, CON30, CON33 points to the coil tap terminals of the assigned (X, Y, Z) motors (they can be identified by a resistance instrument) according to the figure.

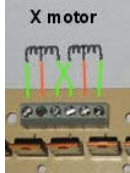
## The correct phase-order necessary for the unidirectional rotation must be searched!

There are two possibilities for that:

### 1.

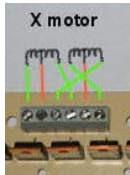
Place the preprogrammed PIC into its case.

Then connect the motors first in the following way:



Now turn on both power supplies and using the moving test function of [PWM Manager programme](#) check whether the rotation is correct (at low number of steps).

If incorrect stepping is noticed, exchange both ends of one of the coils e.g. as it is shown:



### 2.

Turn on the motors' power supply (the coil tap terminals are under voltage, the other ends are free, - in the air)!

Contact one after the other the free ends of the phases to the negative terminal of the power supply of the motors (e.g. CON35) for a moment by using a piece of wire.

The motor will jump to the position assigned to the given phase. Note the direction and measure of the move.

Search for the correct phase order, with that you can get unidirectional rotation by using repeated touchments.

The actual direction does not count, only the fact that the motor should rotate in the same direction in each touchment!

Repeated touchment order:

1--- (the motor makes a step forward)

-2-- (again a step forward)

--3- (...)

---4 (...)

1--- (again a step FORWARD!)

... (...)

If you could get the correct order, note it and connect the lines to the terminals (for each axis)!

1 -> CON17 (for the axis X)

2 -> CON19 (".)

3 -> CON20 (".)

4 -> CON22 (".)

1 -> CON23 (for the axis Y)

...

For further information see information of [PC-Link](#).

Contact the end-positions (care should be taken not to exchange the axes), LEDs (take care of the polarities) as well as the push button.

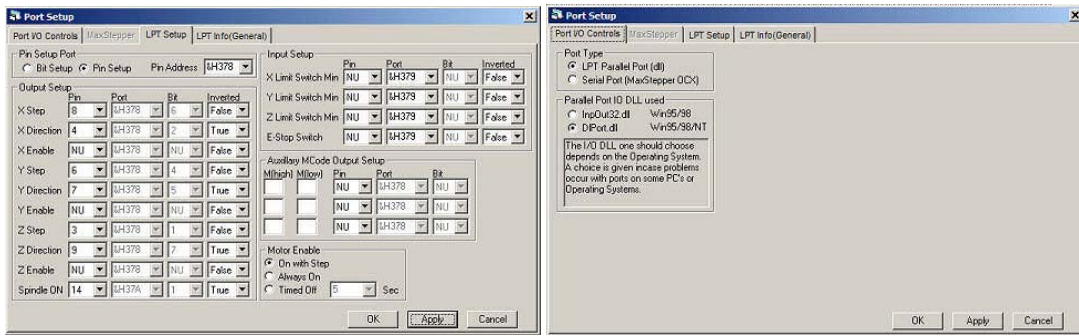
Take the PIC into its case, if you haven't done that, (if it is empty yet, with the digital power supply on upload the Firmware on the ICP).

If everything is ready, it is worth performing all the tests (see [knowledge of the firmware](#)).

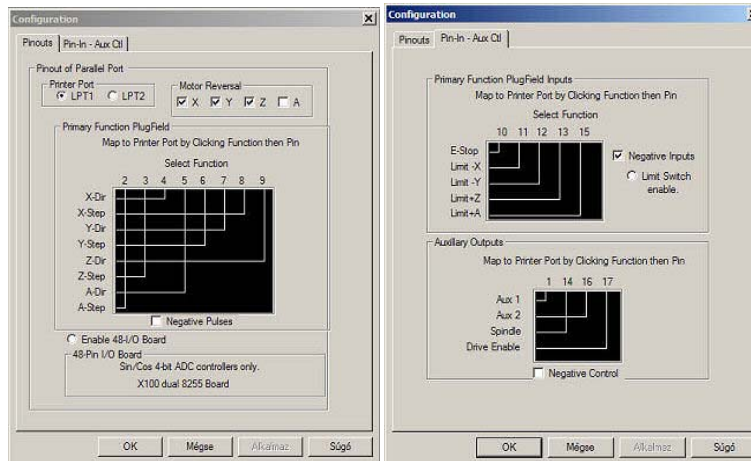
In case of elevated motor voltages see description of Motor tuning.

If everything has been done, the controller is ready for operation.

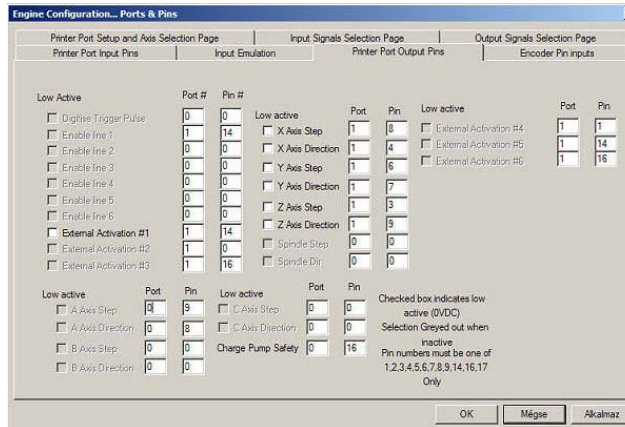
PC-side configuration of the controller (PCB V4.xx):



(KCAM4)



(Master5)



(Mach2 bit setup)

Function	LPT port pinout
Port=&H378	
X Step	8
X Dir	4
Y Step	6
Y Dir	7
Z Step	3
Z Dir	9
Port=&H37A	
Spindle(Mill)	14

(PCB V4.1)

# Special functions

## 1. Functions available both in Online mode (PC - CNC mode) and via Setup procedure:

- Repeated location of end-positions. It locates again the direction- and end position assignments for the individual (X, Y, Z) axes.  
Access: by depressed clear button turning on the CNC (Power ON + push button).
- Motor tuning. Determination of the greatest speed (without step-loss) of the stepping motors + joined mechanical parts by the means of preprogrammed (Setup) step path and error tolerance.  
Access: by depressed YV1 and YV2 or ZV1 and ZV2 end position switches turning on the CNC (Power ON + YV1 + YV2 3D) or (Power ON + ZV1 + ZV2 2D).
- Holding path PWM tuning. Adjusting the force necessary to keep the motors in home position by controlling the manual moving force at constant PWM frequency determined during setup.  
Access: By turned-on CNC press both end-position switches of the Y or Z axis (Power ON + YV1 + YV2 3D) or (Power ON + ZV1 + ZV2 2D).
- Direct data-upload and extended diagnostics, through the LPT port (PC-Link).  
Access: During Power On both end position switch of the X axis should be depressed (Power ON + XV1 and XV2).\* (PC-Link)

## 2. Functions available only via setup:

- Identifying the motor phases by the means of end-position LEDs and push-button tests.
- Diagnostics of counters.
- Switching on the On line forced Inpulse Loss Detection (modified Online mode).\*
- Load test of the power supply of motors up to 200 % \*(PC-Link)
- Direct identifying of motor phases \*(PC-Link)
- Elevated-voltage mode of motors \*

Detailed description of special functions can be found in the detailed description of the controller in the chapter of Manual Setup.

\* These functions are available only with Profi Firmware!