

Profiler Pro

New processor board, increased software capabilities and mechanical upgrades

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3D workpieces, G-code, milling printed circuit boards: thanks to a new controller board with a powerful ARM processor and a new, robust Z-axis with floating head you can upgrade your existing Profiler milling machine to a 'Pro' version. The software has also been adapted to take advantage of this and has many improvements and new features.

About two and a half years ago, when Elektor and Belgium-based manufacturer Colinbus thought of putting together a simple, handy and (importantly) affordable milling machine for use in the home workshop, none of the company representatives involved in the discussions had any idea about the runaway success their joint project was to become. The Elektor/Colinbus Profiler turned out to be a 'hit' and an enormous number of kit sets for this machine were sold. Very quickly an active community formed whose members would analyse the machine down to the tiniest of details. Equally quickly there were modifications and suggestions for improvements. Both the users and the manufacturer actively continued to explore all possibilities of further improving Profiler.

The designers from Colinbus have spent a considerable amount of time improving and advancing the development of the Profiler, and the developments have now reached a point that allows us to publish the various new features. In particular the combination of all these new features (a new processor board, modified software and several mechanical upgrades) results in a revolutionary improvement. Not every user will have the need for these improvements however. It depends entirely on what you expect from your Profiler and the types of task you want to have it perform. If you only want to mill 2D shapes from lighter materials and don't have any special demands then the existing machine will work very well for you. For these users, the existing Profiler will already cater for the most complex shapes, much faster and more accurate than before.

But other users demand more and often have been active exploring various solutions and possibilities for themselves.

We listened carefully to all these wishes and Colinbus has attempted to steer further development accordingly. By offering the parts described here we hope to have met the most important requests. With these changes the Profiler becomes a more professional machine with many new capabilities.

What's new?

As already mentioned, there are quite a few new developments. The most important ones will be introduced in this article.

- Requested by many and now available: the **new 3D controller!** A new processor board has been developed, fitted with a state-of-the-art 32-bit RISC processor. Just like the original controller PCB, it has all logic on board. This new board can simply be fitted on the driver board, in place of the original board.



- **ColiDrive**, the Colinbus control software has been expanded with quite a few new options. The program can now import G-code and is more user-friendly and more powerful in combination with the new controller.
- A new **Z-axis** is available, it's more stable and easier to mount and calibrate.
- And the most important option: a **floating head**, an accessory that you cannot do without when doing high-quality engraving work.
 - With the new Z-axis and floating head now available, an **engraving head** for the Profiler is now also offered.

New 3D controller

Ex factory the Profiler is fitted with a 2.5D controller. This somewhat older controller is used in thousands of machines and works well. With a little effort it can also be used for milling 3D objects, but when doing this you will have to take into account that the computing power of the controller is only enough to control two axes at a time. When creating 3D workpieces you really need a real (more



powerful) 3D controller. The end result will be much nicer and the time it takes to complete a milling job will be much shorter. The FPGA and DSP based controllers used by Colinbus in their bigger machines are too expensive and not suitable for the Profiler. So, it was decided to build a new, cheap, but nevertheless powerful, CNC controller board. This is now available and will be included in a special version of the Profiler.

The new controller board is built around an ARM7, 32-bit RISC processor, which, because it uses 'pipeline' technology, is eminently suitable as a CNC controller. There is not enough space in this article to elaborate on this, but if you are interested you can consult the datasheet from NXP for more details (www.nxp.com/acrobat_download/datasheets/LPC2212_2214_4.pdf).

Even though you're using a state-of-the-art processor, all the cleverness is of course in the embedded software. This, in fact, contains four years of development. 3D circular and collinear interpolation, adjustable exponential acceleration curves and adaptive corner speeds are only a few of the

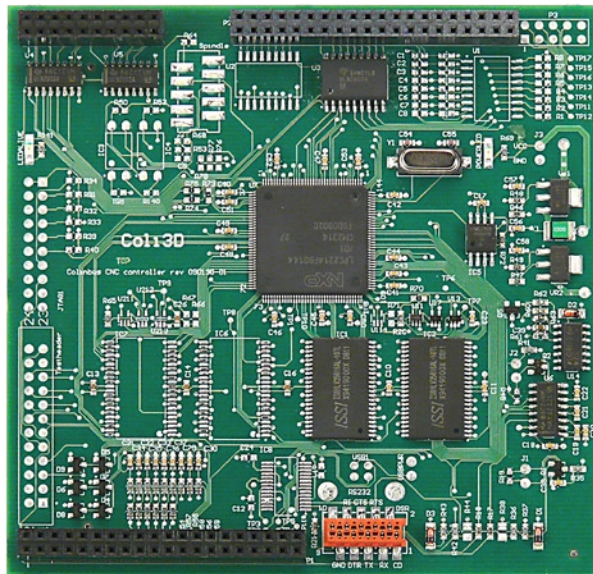


Figure 1. The new PB3D controller board uses an ARM7 processor made by NXP.

many new features that make this controller board so fast and interesting.

What makes the new PB3D controller unique, is its price. That is because it functions in ways you will only encounter in systems that are considerably more expensive. All other controllers in this price range make the attached PC carry out the necessary calculations. Such a PC has much more computing power than an embedded controller and the simultaneous interpolation of multiple axes does require a significant amount of computing power. Writing the software for a PC is therefore much simpler and cheaper. But as is often the case, the easiest path is not always the best, and there are a few disadvantages with this approach. The most important disadvantage is the PC itself. Its operating system (typically Windows) is never completely dedicated to the CNC machine, but it carries out all sorts of other tasks in the meantime as well. This strongly reduces the reliability. In addition, writing your own control software is practically impossible because the software is not open source and the manufacturer does not want to reveal all the control details. The option of working in a Linux or Mac environment is usually not available or desired.

But with the PB3D controller board all the intelligence resides in the controller itself. The PB3D is really a small computer capable of operating completely independently thanks to its powerful embedded software. If desired, users

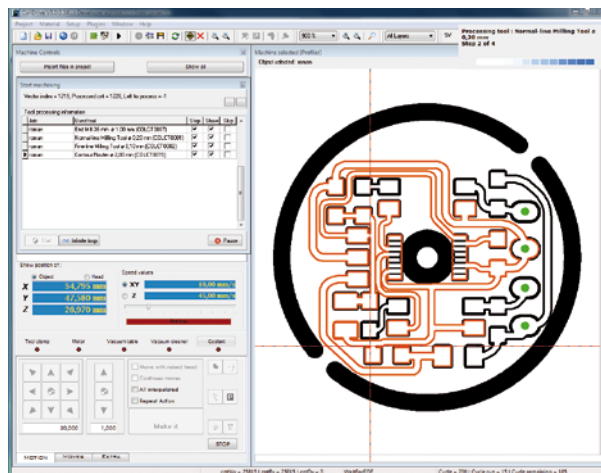


Figure 2. The new version of ColiDrive has quite a few changes and improvements to offer.



Figure 3.
The new Z-axis is more stable and much easier to adjust than its predecessor. In addition it also has a floating head. Here the IACS00 motor from Colinbus is mounted on the Z-axis.

can write application software themselves — you only need to send the correct commands to the Profiler. On the Colinbus website you can find extensive documentation for this (www.colinbus.com/download.htm).

Because of the great computing power of the ARM controller, it is possible to work with much more complex routines, resulting in a more dynamic machine. In combination with the Colinbus software you will have an additional number of powerful features. These features are only available with the new board. These are also related to the processor speed and the new processor technology. And finally — we nearly forgot to mention it — you can convert your existing Profiler into a real 3D machine simply by plugging in the PB3D controller board!

New version of ColiDrive

The latest version of ColiDrive is available to all Profiler users. We strongly recommend that you download this software because there are quite a few changes and improvements.

Note that there are now two versions: one for the original Profiler with the 2.5D controller called Robby, and one for the PB3D, the new 3D controller. The latter version has more features simply because the powerful 32-bit RISC pro-

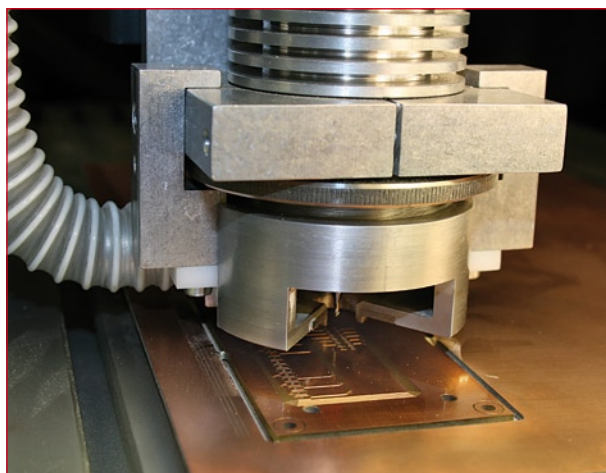


Figure 4.
This engraving head follows the surface of the material accurately and thereby ensures a constant depth.

cessor fitted on the PB3D has more features.

What follows is an overview of the new features, where we will also indicate which functions are only available in the 3D version.

- **Import:** this is what many users were waiting for: the latest version of ColiDrive can import and process G-code directly (with automatic detection of positive and negative Z-coordinates).
- **Plug-in:** milling or engraving of text in any size. This uses any of the 'true type fonts' that are available on the PC.
- **Direct milling or engraving of circles and squares** without the need to use a CAM package. The user can select a tool and indicate whether to mill inside, outside or on the line. The software calculates the offset.
- **Support for a series of new drill functions:**
 - drilling
 - counter boring
 - peck drilling
 - boring
- **New improved tool library with 'Tool Life' calculation.**
- **Calculation of the expected processing time and costing.**
- **Complete 3D-support (only with PB3D controller).**
- **The progress of the operation can now be followed in real time on the screen (only with PB3D controller).**
- **Every mill depth has its own colour (only with PB3D controller).**
- **Pause function:** you can interrupt the machine at any time, perform some action and then resume. (only with PB3D controller).
- **Obstacle database:** Enables the user to place an obstacle on the screen. The milling head will not go to that location. In this way you can protect objects. Obstacles can be stored and reused at any time (only with PB3D controller).
- **ColiDrive now has an Undo and Redo functions (5 levels deep).**
- **The project explorer keeps track of all data for a loaded file.** This gives you a complete overview of all the operations that have been carried out on loaded files.
- **New positioning options for jumping to a corner or centre of an object.**
- **Aligning different files above or next to each other has become much easier.** Alignment can be done using different reference points such as 'bottom left', 'From-file centre point' and from 'calculated file centre'.
- **Modern user interface with active icons.** These appear only when required, which makes the software a lot more user friendly.
- **Many time saving features such as 'optimised down movement'.** This makes the head move downwards at full speed up to a preset distance above the workpiece and then changes to the working speed. This function can reduce the working time by up to 65%.
- **'Slow retract feed':** this function allows you to have independent up and down speeds — very interesting when making deep holes.
- **Support of tool length measurement in a very simple manner (only with PB3D controller).**
- **In the event of a problem, Colinbus Support can, with your agreement, make contact with your machine.** Long telephone conversations or the sending of a series of emails can so be avoided (only with PB3D controller).

The above is a limited overview of the most significant changes. You will have seen that it is certainly worth the effort to download the update. You will also receive

an update to ColiLiner. This also contains a number of improvements.

New Z-axis

Most buyers of the original Profiler kit had little trouble with the assembly of the machine. When there was trouble, it was almost always related to the Z-axis. Adjusting the guide wheels was indeed not that simple. When a number of Profilers are set up next to one another — for example at a training session — you may notice that there is some play in the Z-axis of some of the machines and this, of course, leads to poor milling results. While this can be solved with a small adjustment, this is not so easy to do because of the way the Z-axis is constructed. The Z-axis is actually the weakest part of the Profiler — it's more than adequate for light-duty milling, but unsuitable for heavier spindle motors.

That is why Colinbus have designed an entirely new Z-axis for the Profiler, which is not only stronger but also more accurate than the first. Assembly and mounting is a breeze and the fact that this Z-axis also has a floating function is the icing on the cake. All these improvements come at a cost however — the new Z-axis is more expensive than the previous one and is therefore mainly intended for Profiler users requiring the heavier milling capability or more accurate results.

Since many users are using the Profiler for milling printed circuit boards and for engraving front panels, a decision was made to provide this new Z-axis with a floating head. If you need to do heavier milling work then you can lock this function.

A nice feature of this is that ColiDrive has a number of provisions to make optimum use of this engraving function. So for example, it is no longer necessary for you to set the Z reference point ('zero') when milling printed circuit boards. ColiDrive saves all the parameters in a database, so that milling identical materials (such as PCBs, for example) becomes much easier.

Engraving head

For quality engraving work you need, in the first instance, a head which will follow the surface of the material. But you also need some mechanism that sets the milling depth. The engraving head now offered with the Profiler comes from the professional machines produced by Colinbus and has been made especially for the milling of printed circuit boards. With this head the milling depth can be set very accurately. On the side there is a facility for attaching a vacuum cleaner. This is important because otherwise the



Figure 5. A few 3D workpieces made using a Profiler Pro machine.

head will slide over the top of the dust pile and the set milling depth will no longer be correct. This milling head can currently only be used in combination with a high-frequency motor.

If engraving text is the only thing you want to do then you could also make an engraving head yourself, because the professional engraving head is quite expensive. The only objective is to maintain a constant distance between the material and the tool. A few construction drawings for this are available on the Colinbus website. Certainly of interest is the file 'graveerhet.doc', which clearly explains the how and why of engraving (see www.colinbus.com/free-howto.htm).

Finally

By simply plugging another controller board into your Profiler you will obtain an entirely different machine. The new PB3D controller makes the machine faster, increases the number of features and enables you to make real 3D workpieces. The new and improved ColiDrive software is supplied free.

Users who want a more robust and more accurate Profiler can fit a new Z-axis.

On the Elektor website you'll find a short video which shows the new configuration in operation: www.elektor.com/profilerpro.

Elsewhere in this issue you will find more about the prices and ordering options of the upgrades described here.

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Upgrade your Profiler to a PRO milling machine!

New 3D controller board, extended software and various mechanical upgrades

ORDER NOW

3D controller-board (assembled and tested) incl. ColiDrive en ColiLiner update	£ 339.00 / \$ 494.00 / € 380,00
New Z-axis with floating head (assembled)	£ 404.00 / \$ 590.00 / € 454,00
Professional grade engraving head	£ 263.00 / \$ 384.00 / € 295,00

Prices include VAT, exclude postage and packing.

For more information, a demo video and ordering go to via www.elektor.com/profilerpro