

# 1 Product description MDLCNC GFMC interface R4M

For the usage of the foam cutting software GMFC a special hardware is required. This add-on card has been developed as an extension to the MDLCNC 4-axis stepper board to use the full functionality of GMFC. In addition, it supports a homing of all axis. It uses the signals of the 4 limit switches connected to the MDLCNC stepper motor board. The 4 switches are simultaneously used as limit switches to secure one direction of the axes. To use the function homing, 4 reference switch (NC or NO, but four of the same type!) must be connected to the MDLCNC. The direction and speed of homing, and the used type of switch (NC or NO) can be recognized at a one-time "learning procedure". The microcontroller can learn the desired speed of homing, the direction and switch type (NC or NO). The values are stored in the permanent memory and will remain available even after switching the power off.

Thereafter, the homing movement can be started by pressing the "Start" button. Then the portals drive into the direction of all the four homing / limit switches until they are pressed and then go back a bit.

The "Start" button is also an "emergency" that stops when pressed again, during the machine moves.

By pressing the "Learn" button while moving the portals, new values can be learned or old are overwritten. If the "Learn" button is pressed at a standstill, the values are deleted and the factory setting is restored. To delete all values the motors must be standstill with holding torque and not be stopped by "Emergency Mode". Then the R4M interface works without homing function and it has only the timer and heating control.

In addition to the functions described above, two timer frequency can be set (10 or 20 KHz) and the temperature control can be steered by GMFC or manually by the potentiometer on the board. These saves a lot of test cuts when other material or another cutting wire is used. It is easier in the manual mode to try different settings of the potentiometer and measure the current to have good cutting results. Then switched to automatic and configured the measured current with the % values in GMFC. In automatic mode the potentiometer setting has no effect.

## Technical data:

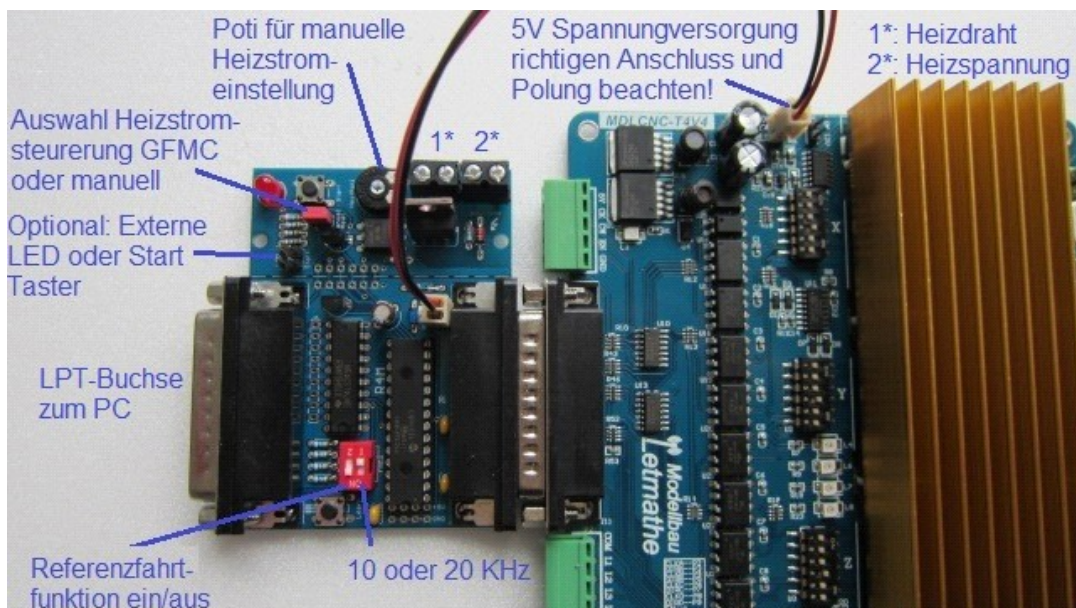
- A microprocessor-controlled timer with selectable frequency 10 KHz and 20 KHz
- A microprocessor controlled temperature control, by GMFC or manually by potentiometer
- Available with or without homing feature
- Galvanic isolation of the heating control by optocoupler
- Matching 25-pin plug and socket for plugging in between the PC and the stepper motor card
- Screw terminals for heater voltage and input voltage: 16-50 V, Current up to 10 A.
- Pin connector for the 5 V logic voltage (can be picked up from MDLCNC 4-axis stepper motor card (cable included)).

## Scope of delivery:

- Ready assembled and tested card with programmed microcontroller
- Connection cable for the 5 V power supply from the MDLCNC 4-channel stepper motor card.

**Note: Check polarity and correct pin header (5V)**

- English manual



At the left 2 pin terminal (labeled "Wire") the cutting bow with the cutting wire has to be connected.

At the right 2 pin terminal (labeled "Vheat") the heating voltage is connected with correct polarity. DC power supply must be used. **Note Plus and Minus!**

## 2 First Steps

If the homing function is used, the homing switches are also used as switches limit switches and should be mounted at the end or at the beginning of the portals. The best position is that they will not be triggered during normal operation, but for the homing or if there is a malfunction. For safety openers are recommended that wiring problems (cable break or poor contact) will stop the machine.

The switches has to be electrically wired in accordance with the instructions of the MDLCNC stepper motor control. The function can be tested as described below.

The reference switch must be the same type (normally closed or normally open) Otherwise the type cannot be learned during the learning process (see below)

During the setup, only the settings are made and the interface should be supplied with 5V at the end.

### A) R4M installation

The board is placed between the parallel port of the computer and the stepper motor board. If applicable the nuts and shield of the DB25 must be removed or insert another parallel port cable.

### B) Choose Timer frequency

With DIP switch 1 the timer frequency is set. ON = 20 KHz, 10 KHz = OFF. Only if the computer is fast enough, 20 KHz should be set and the timer displayed in GMFC should then stand at ~ 50.

At 10 KHz the timer is at ~ 100.

### C) DIP switch 2 setting

The DIP switch 2 has always set to OFF, regardless of whether the R4M is used with or without homing.

### D) Manual or GMFC controlled heating

Manual heat control with can be selected with the jumper "Manual Heat" Without jumper: Manual Heat (control via the potentiometer). With jumper: Heat control by the GMFC software. If the control of the heating current should not be steered by the R4M interface the jumper should not be set and no cables for heating voltage and wire must be connected to the two terminals.

### E) Install and configure GMFC

If GMFC is not installed or configured, the software must be installed and configured according to the software instruction manual. Hints can be found in Chapter 4, "Configuring the GMFC Hotwire Driver".

**If the R4M Interface Board is used without homing feature, all necessary steps are done and GMFC can be used as soon as the R4M card is supplied with power.**

### F) Supply R4M interface board with voltage

After the settings 5V power can be connected. The positive cable (+) is red, the minus (-) cable is black. **Use the correct pin header (5V) of the MDLCNC and note the polarity!**

Without the homing feature the LED turn on briefly and then off. The "Start" button can be used as an emergency switch (LED flashes short-short-long). Pressing the "Start" button again the emergency stop is switched off again. If a homing / limit switch is triggered (without homing feature), the machine stops and the LED flashes the ID of the limit switch (between 1x and 4x) until the limit switch is deactivated again. This must be done mechanically by example by rotating the spindle back by hand (no holding torque on the motors in "emergency").

Was the card used before with homing function (learned state) and should now be used without the function, the factory settings can be restored (see chapter 1)

Note that the settings from the DIP switches are read once, when the R4M is supplied with 5V.

### 3 Further steps if the homing feature should be used

#### Learning procedure when using the R4M with homing the first time or for re-learning

##### A) Checking the reference switches

The first step is to check if the limit switches (connected to the MDLCNC) are working correct. These portals should be positioned that the limit switches are not triggered.

If the R4M is supplied with power, one switch after another should be pushed by hand and the corresponding LED code should be shown. The blink codes are.

Switch 1: 1 flash  
Switch 2: 2 flashes  
Switch 3: 3 flashes  
Switch 4: 4 flashes

This blink code is repeated in 2 seconds distance, as long as the switch is activated.

**Then continue until all 4 switches successfully detected and all 4 blink codes were displayed.**

##### Note

Loose contacts, electronic or not debounced switch can cause problems.

##### B) Learning

When the homing / limit switch function has been tested and is OK, the direction and speed and switch type (NO or NC) must be "learned". To learn the parameters the axis has to be moved with the desired speed away from the homing switches. The movement has to be carried out with GMFC in the menu "Zero axes" > Move axis, e.g. 100 mm. Try minus and plus values until the portal moves away from the switches. While the motors are running please push the "Learn" button. No limit switch should be pushed at that moment. The axes are now automatically moving sequentially to the homing switches. The direction, speed, and switch type normally are learned. The unique learning process is now complete and the values are written into the permanent memory of the microcontroller. Re-learn and reset, see above.

##### C) Supply R4M interface board with voltage

After the settings 5V power can be connected. The positive cable (+) is red, the minus (-) cable is black. **Use the correct pin header (5V) of the MDLCNC and note the polarity!**

##### D) Normal operation with homing

Because the PC sends undefined outputs signals on LPT port at start up, the MDLCNC card with activated homing feature is disabled until a homing run is performed. To indicate that the MDLCNC card is disabled (ignores signals from the PC) the LED blinks continuously. To start the homing please push the "Learn" button.

For normal operation turn on the devices in the following order. 1st PC and then the machine with the steppercontroller and R4M interface. Then start the homing. During the homing the portals are moving in the direction of the homing switches, stop as soon as they press one or more switches and then run a little away from the limit switches. The "Start" button can be used as an "emergency" during homing.

Thereafter, the portals are in reference position, the R4M interface activates the MDLCNC over the enable signals and GMFC can fully control the machine (LED off).

However, the reference run can be started every time when the motors are not running.

**Note:** The first time you press the start button in the operation always triggers an "emergency". After pressing the "Start" button again, the homing is performed automatically and release the machine again.

##### Note LED

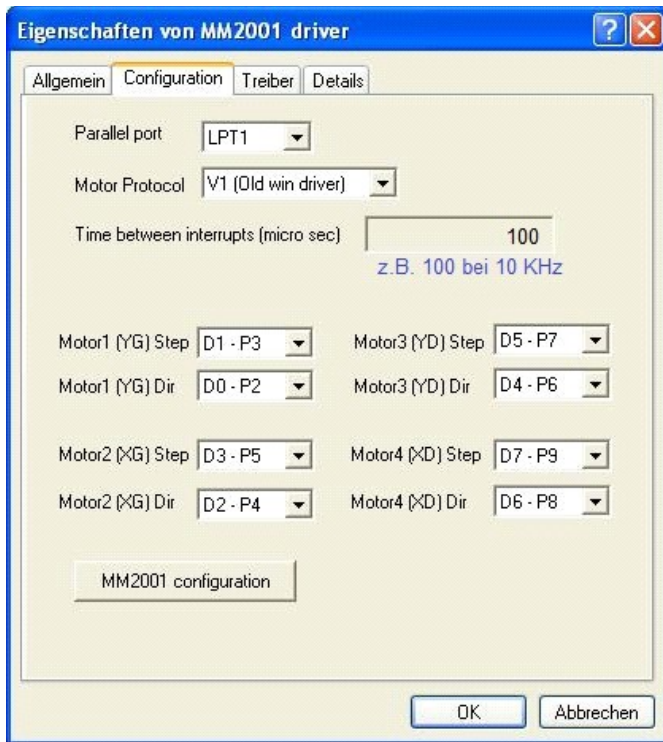
When one or more switches are activated and the R4M is /un-learned" the LED flashes short-long-long to indicate this state. Then move the axis manually (no holding torque) to release the switch(es) and push the "Start" button to activate the machine.

### 4 Configuring the GMFC Hotwire driver

In the Control Panel under System > Device Manager, you can find the Hotwire driver that is installed by GMFC. In the line "parallel port" you can select the correct LPT port. For a system with onboard LPT port, this is often LPT1.

If the R4M interface is up and running and connected to the LPT port the timer value should be displayed behind the field after "Time between interrupts (micro sec)". If 10KHz is configured with the jumper 100 should appear. For 20 KHz 50.

The PIN configuration depends on the stepper motor controller. In the picture you see the settings for the MDLCNC stepper motor controllers. It is the default configuration and there is no need to change anything.



## 5 Blink codes of the LED

These codes are repeatedly flashed every 2 seconds in emergency mode until the cause is corrected..

Blinkcode	Description	Trouble shooting
1-4x short	Homing / limit switch is activated. ID of the switch is flashed.	<ul style="list-style-type: none"> <li>unlearned: Move the axis manually to release the switch(es).</li> <li>Press the "Start" button.</li> <li>learned: Start Push "Start" button for homing.</li> </ul>
short-short-long	"Start" button during operation was pushed → emergency	Press the "Start" button to acknowledge emergency and activate MDCLCNC
short-long-short	"Start" button during the learning process was pushed → emergency	Press the "Start" button to acknowledge emergency and activate MDCLCNC. R4M remains unlearned.
short-long-long	After switching the power on or during the learning process: Different levels at the homing switches.	<ul style="list-style-type: none"> <li>Check connection and function of the homing switch (see Chapter 3). All 4 must (be normally open / closed) of the same type.</li> <li>Move the axis manually to release the switch(es).</li> <li>Press the "Start" button.</li> </ul>
long-short-short	During the learning process: No pulse signals detected -> no movement started.	<ul style="list-style-type: none"> <li>Press the Start button to activate the stepper board.</li> <li>Move axis with GMFC (menu "zero axes") away from the homing switches</li> <li>Press Learn button.</li> </ul>
long-long-short	Software error	Please contact developer of the R4M

## 6 Safety instructions

### **The safety instructions must be read and considered prior using to using the product!**

Electronic and mechanical components and motors have to be handled only by responsible, clear thinking people. The construction and operation requires technical knowledge, skill, and a responsible behavior. Errors or deficiencies in construction, commissioning or operation can cause very serious personal injury or damage. Technical defects or faulty approach can lead to sudden starting of the motor or the machine or electric shock. The electrical wiring, insulation and the installation of an enclosure has to be carried out according to national regulations (eg VDE / EMV).

Neither the manufacturer nor the seller has an influence on the proper preparation and use of the machine / unit and make you is aware of these dangers and exclude all liability.

Please ensure that only an intact machine or device is used.

### **In addition, please note the following instructions**

- Operate electronic and mechanical components, never in the wet. The electronic components may be damaged.
- Do not expose the components and the machine to direct sun.
- Check the machine before and after each use for damages.
- Make sure that only a machine is used, which is fine.
- Do not operate the machine unattended.

### **Safety of children**

Children often cannot properly assess risks and thereby injured. You should therefore:

- Be very careful that the machine is always out of reach of children.
- Ensure that the packaging film is not a death trap for children. Packaging films are not toys.
- Small parts may not be out of reach of children: Risk of swallowing.

### **Disclaimer**

Because the company Modellbau-Letmathe is not able to control the use nor the installation and construction of the machine and its maintenance, the company cannot taken over any liability for any loss, damage or expense. Any claim for damages that may result from the construction and operation, or somehow related to it will be rejected. For personal injury, property damage or consequential, arising from our work and delivery, we accept no liability. Extent permitted by law, the obligation to pay compensation, for whatever legal reason, is limited to the invoice amount of the directly affected product from Modellbau Letmathe. This does not apply if we need to be legally responsible because of proven or serious negligence.

### **Disposal**

The crossed-out wheeled bin means that the product must be exposed to a separate collection in the European Union. Products and all accessories marked with this symbol. Featured Products should not be disposed of with normal household waste but in a collection point for recycling electrical and electronic equipment. Recycling helps to reduce the consumption of natural resources and protecting the environment.

