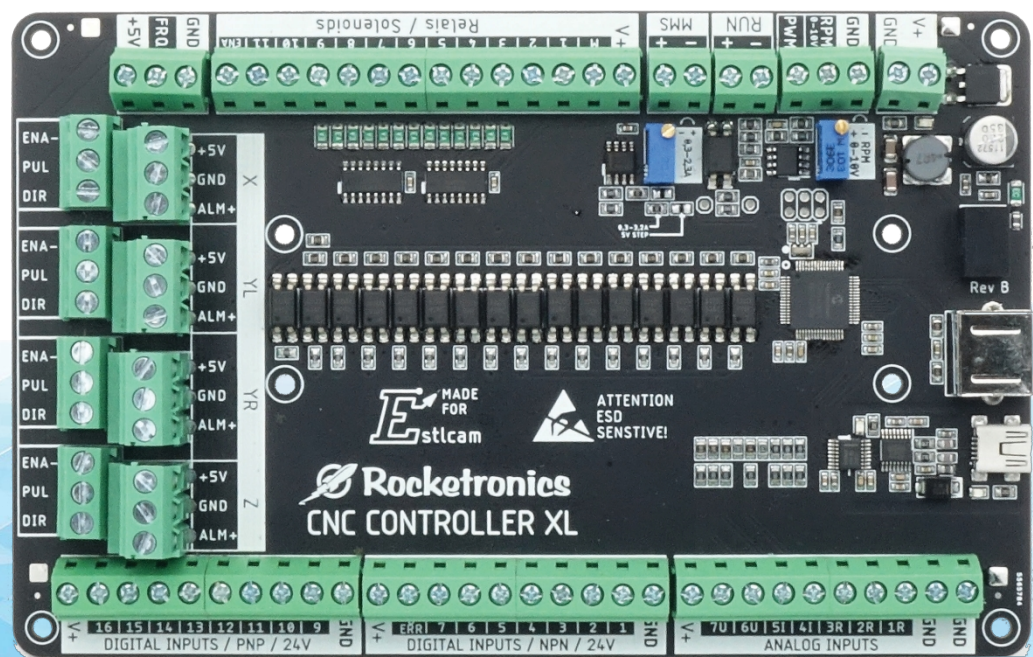


# ESTLCAM TERMINAL ADAPTER XL

User manual



ORIGINAL OPERATING  
INSTRUCTIONS

German

This manual describes the commissioning and use  
of the Estlcam XL terminal adapter

REV A



# CONTENTS

---

System diagram.....	2
Protective note.....	2
Disclaimer.....	4
Addressee of the documentation.....	4
Safety instructions.....	4
Notes on the function.....	5
Notes on installation.....	5
Intended use.....	5
Disclaimer.....	5
EMERGENCY STOP Installation.....	8
Scope of delivery and accessories.....	8
Technical data:.....	8
Compatible motor systems:.....	8
Furnishings:.....	9
Connection overview:.....	10
Commissioning the hardware.....	12
Connect the control unit to the computer and install the driver if necessary:.....	12
General information on cabling:.....	12
Connect external 24V power supply:.....	13
Connection of power amplifiers, drivers and motors:.....	14
Digital inputs for switches, proximity sensors etc. ....	16
Analog inputs for temperature sensors, pressure gauges, etc. ....	17
Outputs for milling motor, relays and solenoid valves:.....	18
Connection of a spindle or a frequency inverter.....	22
Connection AMB / Kress milling motors.....	23
Connection of Mafell milling motors with external speed control.....	25
First commissioning of the software:.....	26
Settings.....	27
Configuration of the inputs:.....	29
Connection of additional modules to the mini-DIN connector:.....	31
VERY important - Increase USB communication speed:.....	32
Tips: Eliminate USB faults.....	33
The Estlcam handwheel.....	35

## **DISCLAIMER**

We have checked the contents of this publication for conformity with the hardware and software described. Nevertheless, deviations cannot be ruled out, so that we cannot guarantee complete conformity. However, the information in this publication is checked regularly and any necessary corrections are included in subsequent editions

## **ADDRESSEE OF THE DOCUMENTATION**

This documentation is intended for machine tool users and installation personnel. The publication describes in detail the information required by the user for installing and operating the control unit.

## **SAFETY INSTRUCTIONS**

This manual contains instructions that you must follow for your personal safety and to prevent damage to property. The instructions for your personal safety are highlighted by a warning triangle, instructions for property damage alone are shown without a warning triangle. Depending on the hazard level, the warnings are shown in descending order as follows.



### **DANGER**

means that death or serious bodily injury will occur, if the appropriate precautions are not taken.



### **WARNING**

This warning means that death or serious injury may occur if the appropriate precautions are not taken.



### **CAUTION**

with warning triangle means that minor personal injury may occur if the appropriate precautions are not taken

### **CAUTION**

without a warning triangle means that material damage may occur if the appropriate precautions are not taken.

### **ATTENTION**

means that an undesirable result or an undesirable outcome condition can occur if the relevant instructions are not followed

## **NOTES ON THE FUNCTION**

The Estlcam terminal adapter is a simple CNC controller that is controlled by the Estlcam software. The terminal adapter is the hardware, the Estlcam software is the associated software. This manual only describes the hardware and its commissioning and connection.

The terminal adapter is used to connect motor drivers, sensors, limit switches, spindles, suction etc. so that the software can control them. For this purpose, it has a series of connection terminals. The exact function of these terminals is described below.

The Estlcam V11 or V12 software runs on a Windows PC and uses the loaded G-code, which defines the movement commands. Control commands are **generated** from this G-code and sent to the terminal adapter via the USB interface. Among other things, this has a microprocessor that receives the commands and uses them to generate control signals for the motors. At the same time, it controls the outputs and reads the inputs, reporting their statuses back to the software, which can react accordingly.

It is therefore a CNC control system, consisting of hardware and software, with which a milling machine can be controlled automatically.

The Estlcam software can only be used with this hardware from version 12.

## **NOTES ON INSTALLATION**

The control unit is intended to be installed in a stationary system. It can only be used on its own as a device if it is connected to a machine that has drive motors and other components. An automatic machine is only created in combination with these parts. The user or installer must therefore ensure that the entire machine complies with the legal guidelines once installation is complete.

## **INTENDED USE**

The control unit is used to control stepper or servomotors (or similar drives) for operation on a milling machine. Any other use is considered improper use.

Supplied accessories such as power supply units, output stages, sensors or motors must only ever be used as intended.

## **DISCLAIMER**

Rocketronics manufactures components that are used in a wide variety of machines. The selection and use of Rocketronics products is the responsibility of the system builder or end user. Rocketronics accepts no responsibility for the integration of the products into the end system.

Under no circumstances should a Rocketronics product be incorporated into a product or structure as a safety control. All products containing a component manufactured by Rocketronics must be supplied to the end user with appropriate warnings and instructions for safe use and operation. All warnings provided by Rocketronics must be communicated directly to the end user.

The user of this control system must ensure that all necessary safety precautions have been taken and checked for proper functioning to ensure safe operation of the machine. The construction or conversion of a machine modifies a potentially dangerous device. The automation of movements can lead to damage to the machine, but also to serious injury to the operating personnel.

## Professionally qualified staff

Qualified personnel must be able to correctly interpret and implement the safety instructions and warnings. They must also be familiar with the safety concepts of automation technology and have received appropriate training. Unqualified intervention in the devices or failure to observe the warnings in this documentation or the warnings displayed by the device may result in damage to property or personal injury.

## EU directives on product safety

The following EU directives were observed:

2011/65EU	RoHS
2014/30/EU	Electromagnetic compatibility (EMC)
DIN EN 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements
DIN EN 61326-1	Electrical equipment for measurement, control and laboratory use - EMC requirements

## Applicable regulations

In addition to this technical manual, the following regulations must be observed:

- Accident prevention regulations
- Local regulations on occupational safety

## Safety regulations

- The control unit should only be used by authorized specialist personnel and in compliance with the accident prevention regulations and the regulations of the electrical industry.
- Unqualified persons must not operate the control unit.
- The control unit is designed for operating temperatures of +5 to +40 °C and storage temperatures of -10 to +50 °C. It must be protected from high humidity, vibrations and explosive gases.
- **CAUTION:** Connection and installation work may only be carried out when the appliance is de-energized. be carried out. The installation and use of equipment must be carried out in accordance with the standards of the Declaration of Conformity.
- **CAUTION:** When connecting motors to motor drivers, the correct polarity must be observed. the. Furthermore, the correct motor current must always be set on the driver. To ensure that the speed of the motor can be controlled correctly, the setting of the steps / revolution must be made on the driver. This setting must also be adopted in the control unit settings.
- The respective configuration of the control unit may only be operated with the motor types configured for it. Other or more extensive uses do not correspond to the intended purpose.
- Currents and voltages: The control unit operates with an extra-low voltage of 24V, which can be provided by a power supply unit. No special safety precautions are therefore required on the output side.
- The control unit is built in accordance with recognized safety regulations and complies with the standards and directives listed in the previous chapter.

## Ambient conditions

Protection class:	NONE
Ambient temperature (operating):	+5 ... +80°C
Humidity (non-condensing):	0 ... 95 %
Ambient temperature (storage)	-25 ... +85°C

## Safety instructions and warnings

- The operating instructions must be read before commissioning and using the appliance for the first time.
- The safety and accident prevention regulations applicable in the individual case must be observed.
- Before switching on the control unit, ensure that the operating voltage specified on the device matches the supply voltage.
- Proper and safe operation of the product requires proper transportation, storage, installation and assembly as well as careful operation and maintenance.
- Do not use a damaged control unit
- Switch the appliance off immediately if it shows any noticeable deviations from normal operation.
- Rocketronice.de only guarantees the proper functioning of the device if no changes have been made to the mechanics, electronics or software.
- The appliance may only be opened and adjustment, maintenance and repair work may only be carried out by appropriately trained specialist personnel.
- The controller may only be used for the purpose described in these operating instructions. Any other use is considered improper use. The manufacturer is not liable for any resulting damage. The user alone bears the risk for this.
- The control unit must not be put into operation until it has been established that the entire machine in which this control unit is to be installed complies with the provisions of the EC Machinery Directive as amended.



### WARNING

If incorrect entries are made, the machine equipped with this control system can perform unexpected movements that can be fatal for the operating personnel. It is therefore the responsibility of the system designer or end user to ensure that the settings are correct and have been checked.



### WARNING

It is essential that the control system is integrated into the machine's emergency stop function. This function must be designed in such a way that after the emergency stop condition has been eliminated, a release by the user is required before the machine is ready for operation again. It must not be possible to restart the machine independently.

## **EMERGENCY STOP FACILITY**

The complete machine must have an emergency stop device in which the control system must also be integrated. An automatic restart after the emergency stop has been triggered must be safely prevented! For this purpose, the emergency stop circuit should contain a contact that is connected to one of the inputs of the control unit. This input must then be set to the "Error message" function. If it is activated, the control unit stops further movements of the axes.

A category 1 emergency stop is required:

*CONTROLLED SHUTDOWN WHILE MAINTAINING THE ENERGY SUPPLY IN ORDER TO CARRY OUT THE SHUTDOWN. INTERRUPTION OF THE ENERGY SUPPLY ONLY AFTER THE MACHINE HAS COME TO A STANDSTILL.*

This procedure brings the spindle and drives to a standstill as quickly as possible. Only then can the power supply be interrupted. A blunt shutdown of the power supply usually leads to the spindle running on for a longer period of time.

## **SCOPE OF DELIVERY AND ACCESSORIES**

The scope of delivery includes a control board and a bag with 4 spacer bolts M3 with nuts for fastening as well as these instructions in printed form.

A top-hat rail holder is available as an accessory, with which the board can be mounted on a standard top-hat rail. A power supply unit with 24V and approx. 1A is also required as an accessory if the inputs and outputs of the board are to be used.

## **TECHNICAL DATA:**

- Dimensions: 170 x 108 mm
- Four M3 threaded bushes / spacers included
- All connections routed to sturdy screw terminals
- Firmware can be easily updated via the Estlcam PC software
- Suitable for CNC milling machines and laser machines
- 4 axis connections, X, YL, YR, Z with connection for ENA and ALM signal.
- 16 inputs for switches, proximity sensors, 8x NPN, 8x PNP
- 1 output for spindle/milling motor Relay
- 1 open collector output for start/stop frequency inverter or laser
- 12 outputs for other relays and solenoid valves
- 7 analog inputs, e.g. for temperature sensors,  
3x resistor, 2x current 0-20mA, 2x voltage 0-10V
- 1 frequency counter input e.g. for flow meter
- 5V PWM and 0-10V analog output for speed control
- Pulse output with adjustable current limitation, e.g. for activating injection valves for minimum quantity lubrication
- Isolated USB connection (Mini-B socket)
- Mini-DIN connection socket for additional modules: Control panel or handwheel.

## **COMPATIBLE MOTOR SYSTEMS:**

All stepper and servo motors that can be controlled via a 5V TTL step/direction signal are compatible, including almost all motors from Leadshine, JMC and many more.

Bus-controlled systems with Ethercat, Modbus, RS232, RS485, field buses, CAN, etc. **CAN NOT** be used. can be used.

## **SETUP:**

- Important: Read first, then screw!
- Always install the latest Estlcam version from [www.estlcam.de](http://www.estlcam.de)

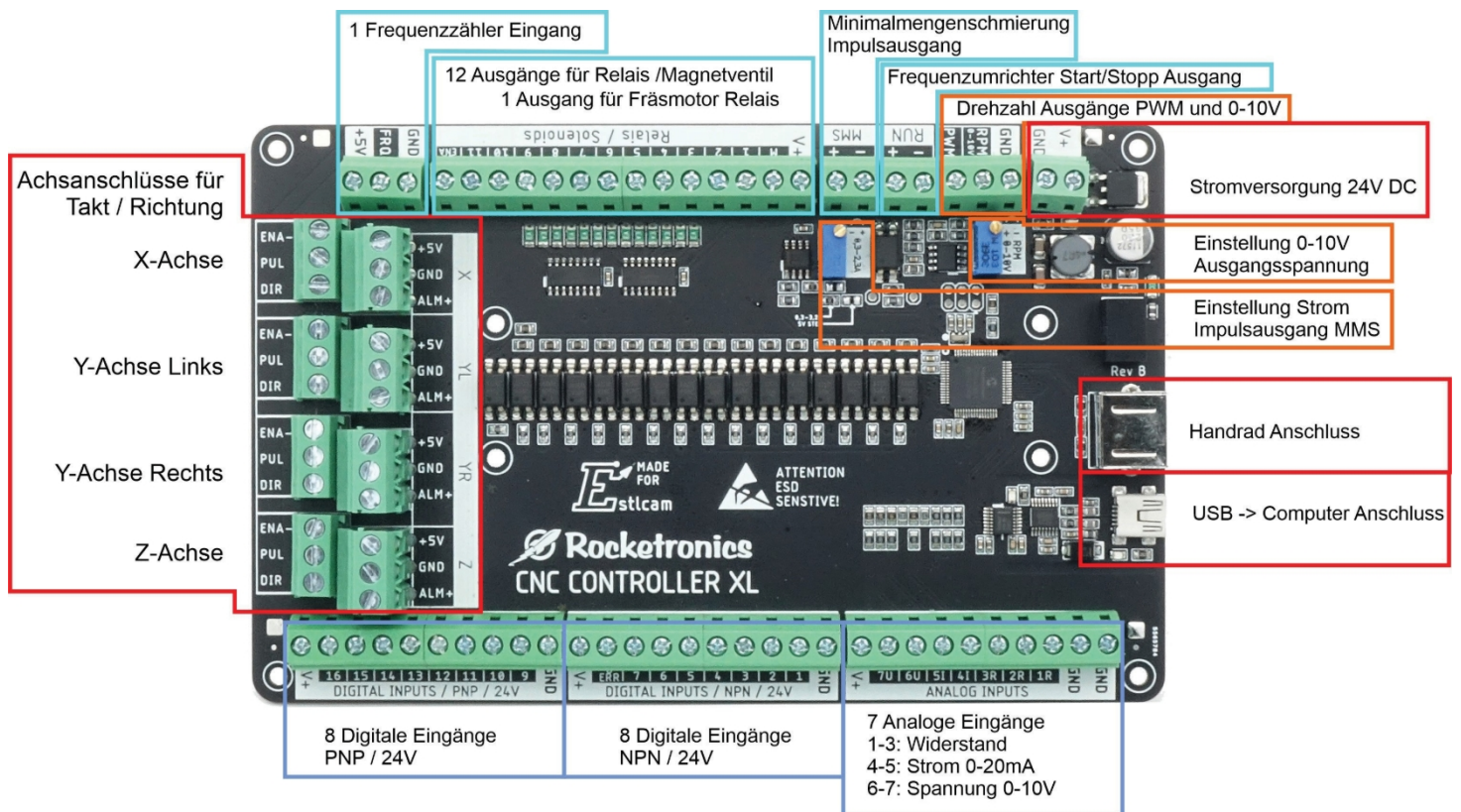
### **CAUTION:**

- Prevent short circuits and reverse polarity!
  - **Short circuits and polarity reversals can damage the controller, connected components and, in the worst case, your computer! This is NOT covered by the warranty.**
  - Mount the adapter so that no chips can fall onto the circuit board during milling.
  - Avoid working on a plastic surface (table, etc.): Static charge can destroy the electronics.
  - When mounting on a metal plate, it must be ensured that the underside of the circuit board does not touch any metal: Risk of short circuit!
  - Ensure that all connections are firmly connected and well insulated.
  - Do not use frayed cable ends! Use wire end ferrules, cable lugs, etc.
  - Always carry out changes without power and with the USB cable **disconnected**.
- 
- Check everything thoroughly before putting the control unit into operation.
  - Be prepared for surprises during commissioning - e.g. the milling motor suddenly starting up. Test without the milling cutter in the air first, keep your distance until everything works as desired.
  - Only use high-quality, well-shielded USB cables. Inferior cables can cause the control unit to suddenly stop in the middle of work.

We recommend proceeding step by step during commissioning:

First connect only one motor and see if it moves. Then gradually connect the other motors. Proceed in a similar way with the limit switches and other peripherals.

## CONNECTION OVERVIEW:



### Adapter power supply (24V):

Connect the "GND" and "V+" terminals at the top right to a 24V power supply unit.

The connection supplies the adapter and is also available at the other "V+" connections for supplying other components

### USB connection

The XL terminal adapter has 1 USB port for the connection to the PC. Use a well-shielded cable that is as short as possible.

### 1x Mini-Din socket:

For the Estlcam handwheel

### Clock / direction signals:

Terminals are available for 4 motors: X, Y Left, Y Right and Z. Terminal function:

- ENA- : Enable signal ENA- of the motor driver (optional)
- PUL: Clock signal PUL+ of the motor driver
- DIR: Direction signal DIR+ of the motor driver
- +5V : 5V voltage
- GND: Ground
- ALM+: ALM+ alarm signal of the motor driver (optional)

For machines with gantry drive on both sides, the Y-axis signals are available twice: Y LI PUL and Y LI DIR for the left-hand side.

Y RE PUL and Y RE DIR for the right-hand side.

If the machine only has a Y-axis motor, it does not matter whether the connections for left or right are used.

**16 digital inputs:**

- GND: Ground
- The inputs are organized in 2 blocks of 8 inputs each:
- Inputs 1 to 8 are "NPN" logic switching against "GND". Input 8 is connected to the ALM+ terminal of the motor signal terminals
- Inputs 9 to 16 are "PNP" logic switching against "V+".
- V+: Power supply (24V)

**7 analog inputs:**

- GND: Ground
- 1R / 2R / 3R: Resistance measurement 0-10kOhm (measurement against "GND")
- 4I, 5I: Current measurement 0-20mA
- 6U, 7U: Voltage measurement 0-10V
- V+: Power supply (24V)

**1 frequency counter input:**

- GND: Ground
- FRQ: Frequency counter input (5V TTL level)
- +5V: +5V for supplying the sensor

**Relay / solenoid valve outputs:**

V+: Common power supply (24V) for the relays / valves

M: Output specifically for the relay for switching the milling motor

1 to 12: Additional outputs (max. 100mA per output), output 12 is connected to the ENA terminal of the motor signal terminals.

**Minimum quantity lubrication Pulse output with current limitation:**

- MMS-: Negative (GND) connection of the pulse output
- MMS+: Positive (+24V) connection of the pulse output

**Frequency inverter start / stop output:**

- The "RUN" output is a potential-free optocoupler output for switching digital inputs of frequency inverters.
- RUN-: Negative connection
- RUN+: Positive connection

**PWM and 0-10V speed outputs:**

- GND: Ground
- RPM: 0-10V analog output / calibratable
- PWM: 5V PWM signal

# COMMISSIONING THE HARDWARE

---

## **CONNECT THE CONTROL UNIT TO THE COMPUTER AND, IF NECESSARY INSTALL THE DRIVER :**

The XL terminal adapter from Rocketronics has a USB socket, which is connected to your computer via a mini USB cable. This USB port is electrically isolated from the rest of the adapter:

- This protects the computer from damage caused by cabling errors or defects in the control unit.
- Improved interference immunity of communication in electrically unstable environments.

A high-quality USB cable is required for the connection to the computer: The cable should at least comply with the USB 2.0 (480MBit/s) standard. Do not use cables that were supplied with other devices as charging cables or are unusually thin:

- CNC machines are electrically "unstable" environments that can interfere with USB connections.
- If the cables are poorly shielded, the USB connection can suddenly be interrupted and the machine stops.
- The total cable length should not exceed 3m.
- The length also includes any USB hubs or extensions in front of it.
- Preferably connect the XL terminal adapter directly to the PC - without any hubs in between: USB hubs are OK in principle, but the chain is only as strong as the weakest link. If the hub is poorly shielded, the entire connection will be susceptible to interference.
- If you insert a USB stick during operation and are statically charged, this can disrupt the connection and bring the machine to a standstill.

If your computer is connected to the Internet, the required driver is usually installed automatically. If not, you can download the driver from the Rocketronics website and copy it to the computer without Internet access using a USB stick.

## **GENERAL INFORMATION ON CABLING:**

To prevent the XL terminal adapter from becoming too large and expensive, many functions share common ground ("GND") and power supply terminals ("V+").

This means that the adapter itself does not have a separate terminal for each cable.

Otherwise, connecting terminals such as Wago 221 or the usual distribution blocks or terminal blocks used in switch cabinet construction are suitable. If you don't use too many functions, you can also combine 2 to 3 cables in a suitable wire end ferrule and possibly make do with the existing terminals. As all "GND" and "V+" terminals are connected to each other, it does not matter which one is used.

Make sure that no cables are mixed up!

- Most of the adapter's connections are relatively tolerant of short circuits to "GND". often works well and if not, the damage is usually limited to 1 part.
- However, if a terminal or part of the board that is not intended for this purpose is accidentally e.g. with the 24V supply voltage usually means immediate destruction of the adapter with damage to several components!
- Past experience has shown that the processor is usually damaged in the process, which is not repairable
- **Damage caused by short circuits and incorrect wiring is NOT covered by the warranty.**
- Use wire end ferrules: frayed cable ends are one of the main reasons for accidental short circuits!
- Before commissioning, ensure that all connections are firmly connected and well insulated.

Tip: If you want to measure the voltage at a terminal to which nothing is connected, turn the screw completely beforehand! When open, the terminals have hardly any contact.

## **CONNECT EXTERNAL 24V POWER SUPPLY :**

The XL terminal adapter requires an external power supply with 24V DC voltage.

### **Connection:**

Connect the positive output / "+" of the power supply unit to "V+" Connect the negative output / "-" of the power supply unit to "GND"

When voltage is applied, the blue LED above the terminal lights up.

- Permissible voltage range: 12-30 volts
- Higher voltages can destroy the adapter!
- Some things do not work correctly at lower voltages.
- The power supply connection is protected against reverse polarity.

Recommendation: 24V because 24V is a common control voltage with a large selection of compatible components.

The power supply is also available via various "V+" terminals on the adapter to supply other components such as sensors.

Recommended power of the power supply unit: 15-50 watts

Suitable power supply units - e.g: MEAN WELL MDR-20-24 24V 1 A

If several solenoid valves and MMS injection nozzles are connected, a power of approx. 50W is recommended, e.g. MDR-60-24.

**CAUTION:** In the case of power supply units with very high power, there is a risk of the adapter cables burning out in the event of a short circuit!

### Notes:

The clock/direction signals and the PWM output of the XL terminal adapter always work with 5V and are independent of the selected power supply

**The motor drivers should always be supplied with power via a separate power supply unit: On the one hand, because the voltage there is usually >30V and would destroy the adapter. On the other hand, because stepper motor output stages are sources of interference whose power supply should not be shared with other components of the controller, even if the voltage is suitable.**



## **CAUTION**

Voltages above 30V can damage or destroy the adapter.

## **CAUTION**

If peripherals are used that are not suitable for the operating voltage, they may be damaged or destroyed

## **CONNECTION OF POWER AMPLIFIERS, DRIVERS AND MOTORS:**

The XL terminal adapter is suitable for all systems that work with 5V Step / Dir signals (step / direction):

- These can be classic stepper motor / power amplifier combinations such as with the Leadshine DM542EU or DM556 etc.
- As well as servos with integrated or external driver.
- Or "Closed Loop" stepper with integrated or external output stage.
- As long as it can be controlled with 5V clock / direction, it works.

There are 4 terminal blocks: X, YL, YR and Z  
function of each of these terminals:

<b>Clamp</b>	<b>Function</b>
PUL	Clock signal PULSE
DIR	Direction signal DIRECTION
ENA-	Enable signal to the driver
ALM+	Alarm signal of the driver
GND	Mass
+5V	5V voltage output

The Y-axis is available twice with "Y LI" (left) and "Y RE" (right) for machines with gantry drive on both sides:

- This enables automatic portal alignment during the reference run:
- Configure the limit switch in the input configuration accordingly as "Limit switch Y / left" or "Limit switch Y / right".
- If only 1 Y drive is used, it does not matter whether it is connected to the terminals for the left or right side.
- An independent 4th axis is not possible!

### **Basic diagram for connecting a motor driver:**

<b>Driver/motor</b>	<b>XL terminal adapter</b>	<b>Connection</b>
PUL+	PUL	Necessary
PUL-	GND	Necessary
DIR+	DIR	Necessary
DIR-	GND	Necessary
ENA+	+5V	Optional
ENA-	ENA-	Optional
ALM+	ALM+	Optional
ALM-	GND	Optional

Drivers with OPTO connection: Some drivers only have 3 connections PUL / DIR / Opto instead of the 4 connections PUL+ / PUL- / DIR+ / DIR-.

"Opto" is a common anode / "+" connection for PUL and DIR and occasionally also with labeled "+5V". The connection diagram is then:

<b>Driver/motor</b>	<b>XL terminal adapter</b>	<b>Connection</b>
OPTO	+5V	Necessary
PUL	PUL	Necessary
DIR	DIR	Necessary

## The XL terminal adapter from Rocketronics has ENA and ALM terminals on the axle connections:

- ENA allows the motor to be switched off, it then makes no noise and consumes no power. It is useful, for example, to pause the machine. The ENA signal is also connected to relay output 12 of the adapter. **Relay output 12 is therefore assigned twice: You can either use it to switch the ENA signal of the motors OR a relay. Both are not possible.**
- ALM is an alarm signal that is activated when the driver detects an error. It is useful for aborting a process to prevent damage to the machine due to a motor failure. The ALM signal is connected to digital input no. 8 of the adapter. **Input 8 is therefore assigned twice: You can either use the input for the ALM signal OR as an input for another signal. You cannot use both at the same time!**
- Connect ENA- to ENA- of the motor driver and +5V to ENA+ of the motor driver. The signal is then activated via relay output no. 12. If this is switched on in the software, the motor is deactivated. If it is switched off, the motor is reactivated. Attention: As a rule, the position of the machine axes is then no longer correct, so a reference run should be carried out afterwards.
- Connect ALM+ to ALM+ of the motor driver and GND to ALM- of the motor driver. The signal can then be evaluated at digital input no. 8 of the XL terminal adapter. Assign the ERROR function to this input to stop execution in the event of an alarm signal.

### Tips:

- Most stepper motor / servo output stages are galvanically isolated to prevent interference with the rest of the system.  
electronics.
- Therefore, "-V" / "GND" of the power supply unit that supplies the output stages should not be connected to "GND" of the rest of the control system, as this would cancel the galvanic isolation.
- The cables between power amplifiers and motors should be shielded:
  - Connect the shielding on the output stage to "GND".
  - Do not connect the shielding on the motor/machine:
    - This would eliminate the electrical isolation between the drive and the rest of the electronics. Instead, connect the protective earth conductor (yellow/green) of the socket to all axes of the machine using separate cables:
      - Earthing -> protection against electric shock.
      - Dissipation of static discharges that could otherwise interfere with the control system.
      - Separate cables for each axis, as linear guides are insulated by the oil film and would otherwise no reliable connection is established.

### Typical problems and tips:

- Some output stages have a 5V / 24V switchover of the input signals which is set to 24V ex works. The output stage then does not react to drive commands or only with dropouts.
- If you have such a power amplifier, set the switch to the 5V position.
- Avoid cheap power amplifiers. It doesn't have to be anything fancy and no-name power amplifiers usually do a very good job, but it can be 20 euros per axle if you want to enjoy it in the long term.

## **DIGITAL INPUTS FOR SWITCHES, PROXIMITY SENSORS ETC.:**

The XL terminal adapter has a total of 16 digital inputs, which are grouped into 2 blocks of 8 inputs each:

- Inputs 1 to 8 have "NPN" logic and react when they are connected to the "GND" connection.
- Inputs 9 to 16 have "PNP" logic and react when connected to the "V+" connection.

The digital inputs can be connected to, for example

- Limit switch (mechanical or proximity sensor).
- Edge finder.
- Touch plates.
- Buttons / Buttons.
- And other digital sensors with "open-collector" output can be connected.

### **Connection of mechanical switches and sensors:**

- Connect a connection of the switch (no matter which one) to one of the inputs 1 to 16.
- Depending on the number of the selected input, the other connection must be connected to a specific terminal:
  - GND if the selected input is in the range 1 to 8.
  - V+ if the selected input is in the range 9 to 16.
- Normally closed and normally open contacts can be used.
- And several switches can be connected to the same input:
  - For normally open contacts as parallel connection
  - For normally closed contacts as series connection.
  - However, the purpose of switches connected together must be identical:
  - Several limit switches can be combined, for example.
  - But not, for example, limit switches with tool length sensors.

### **Connection of inductive proximity switches or NPN / PNP sensors:**

- Both "NPN" and "PNP" type sensors can be connected to the inputs, however:
  - Type "NPN" only at inputs 1 to 8
  - Type "PNP" only at inputs 9 to 16
- Connect the blue wire of the sensor to "GND"
- Connect the black wire of the sensor to one of the inputs 1 to 16
- Connect the brown wire of the sensor to "V+"
- Normally closed and normally open contacts can be used.
- With normally open contacts, several sensors can be connected in parallel to the same input.
- Series connection of normally closed contacts is theoretically possible, but may not be reliable.

### **Connection of other sensors and signals:**

- Inputs 1 to 8 are internally pulled up to supply voltage level "V+" via a 4kohm resistor and are switched by connecting to "GND".
- Inputs 9 to 16 are internally pulled down to GND via a 4kohm resistor and are switched by connecting to supply voltage level "V+".
- This can be done via a mechanical switch, relay contact, optocoupler or open collector output, for example.
- Not compatible with tri-state / push-pull pins (e.g. microcontrollers)!
- If in doubt, ask by e-mail if you want to connect something unusual.

## **ANALOG INPUTS FOR TEMPERATURE SENSORS, PRESSURE GAUGES ETC.:**

The XL terminal adapter has 7 inputs for analog sensors:

- 3x resistance measurement approx. 0-10kOhm
- 2x current measurement 0-20mA
- 2x voltage measurement 0-10V

Analog sensors can be used to monitor temperatures, pressures, fill levels and much more - e.g:

- Overload protection for the milling motor by monitoring the spindle and cooling water temperature or frequency converter output power.
- Vacuum vacuum monitoring so that the machine stops in good time in the event of leaks before the holding force for the workpiece becomes too low.
- Monitoring of minimum compressed air pressure, e.g. to prevent malfunctions of tool changers or clamping devices.
- Fill level monitoring for minimum quantity lubrication etc.

### **Connection terminals:**

- GND: Ground connection= 0V
- 1R / 2R / 3R: Inputs 1 to 3 for resistance measurement.
- 4I / 5I: Inputs 4 and 5 for current measurement.
- 6U / 7U: Inputs 6 and 7 for voltage measurement.
- V+: Supply voltage 24V for the sensor, if it requires a power supply.

### **Resistance measurement:**

- E.g. for
- Temperature sensors type PT1000 (NOT PT100) or NTC5K
- Level sensors 0-190 Ohm
- Or generally sensors that work with significant resistance changes in the range of approx. 0 to 10kOhm.

### **Connection:**

- 1 Connect the sensor connection to "GND".
- Connect the other with 1R, 2R or 3R.
- It does not matter which connection is connected to GND and which to 1R, 2R or 3R.
- The "V+" connection is generally not used for resistance measurements.

### **Current measurement: e.g. for pressure and vacuum sensors.**

- Some frequency inverters can also output the output power or spindle current as a 4-20mA signal.
- Or generally sensors and devices that output the measurement result as a current of 4-20mA (or 0-20mA).
- Such sensors are available with both 2 and 3 connection cables, with self-supplied or adapter-supplied power:
  - 2 wires / supplied via adapter (most sensors of this type):
    - Connect the "Supply voltage connection / +" of the sensor to "V+" of the adapter.
    - Connect "GND / -" of the sensor to one of the inputs "4I" or "5I" of the adapter.
  - 2 wires / own current source (e.g. frequency inverter with 4-20mA current output):
    - Connect "GND / -" of the sensor to "GND" of the adapter.
    - Connect the output signal of the sensor to one of the inputs "4I" or "5I" of the adapter.
  - 3 leaders:
    - Connect "GND / -" of the sensor to "GND" of the adapter.
    - Connect the output signal of the sensor to one of the inputs "4I" or "5I" of the adapter.
    - Connect the "Supply voltage connection / +" of the sensor to "V+" of the adapter.

### **Voltage measurement: e.g. for pressure and vacuum sensors.**

- Some frequency inverters can also output the output power or spindle current as a 0-10V signal.

- In general, sensors and devices that output their measurement result as a voltage between 0 and 10V.

Connection:

- Connect "GND / -" of the sensor to "GND" of the adapter.
- Connect the output signal of the sensor to one of the "6U" or "7U" inputs of the adapter.
- Connect the "Supply voltage connection / +" of the sensor to "V+" of the adapter. If the signal comes from a device with its own power supply, such as a frequency inverter, this connection is not required.

### **Frequency counter input:**

The XL terminal adapter has a frequency counter input that can be used for flow sensors such as the Type YF-B2 can be used to monitor water-cooled milling motors. Attention: only compatible with 5V sensors!

### **Connections:**

- GND: Ground (black cable on the sensor linked above)
- FRQ: 5V TTL frequency counter input (yellow cable on the sensor linked above)
- +5V: 5V to supply the sensor (red cable on the sensor linked above)

### **OUTPUTS FOR MILLING MOTOR, RELAY AND SOLENOID VALVES:**

The XL terminal adapter has 13 outputs to which relays or solenoid valves, for example, can be connected. Relays can then be used to switch devices such as the milling motor, vacuum cleaner, lighting, etc. Or solenoid valves can be used, for example, to open and close clamping devices, switch sealing air and blow-out air for spindles, etc.

Connections:

- "V+" Common power supply for all relay connections.
- "M" relay connection specifically for switching the milling motor on/off.
- "1" to "12" relay connections for any other switching tasks.

Attention: Output 12 is also connected to the ENA of the axle connections!

### **Attention: Maximum current carrying capacity 100mA per output:**

With standard relays and pilot-controlled solenoid valves, there are normally no problems here. With positively controlled valves, however, you should take a closer look and connect a relay upstream if necessary. Avoid short circuits! Although the outputs are largely short-circuit-proof, in rare cases it can still lead to damage to the adapter!

### **Connection of mechanical relays:**

The cheapest solution, but in rare cases interference with USB communication is possible. Many relays have integrated freewheeling diodes:

- If a relay with a freewheeling diode is connected the wrong way round, this will result in a short circuit!
- The relay outputs are largely short-circuit-proof, but without guarantee!
- Relays for which it is not clear whether freewheeling diodes are present - and how they are polarized - must not be connected!
  
- Connect "A1 (+)" of the relay to V+
- Connect "A2 (-)" of the relay to the desired output.
- Ensure that the coil voltage matches the supply voltage of the terminal adapter, see 12 to 24V power supply
- Relay with 24V coil voltage suitable for most applications: Wago 788-304 24V

If the relay has a contact, this contact is used to switch the L conductor of the mains to the load. N is then permanently connected to the load.

If the relay has 2 contacts, you can switch L and N to the load.

Contacts 11 and 14 or 21 and 24 are the NO contacts on the relay.

### Connection of solid state relays (SSR):

SSRs are relatively expensive, but switch with low interference and can be connected without the risk of short circuits due to the lack of freewheeling diodes.

- Connect "A1 (+)" of the relay to V+
- Connect "A2 (-)" of the relay to the desired output.

Attention:

- Only use SSRs with a zero crossing circuit. Otherwise the relay may be destroyed by inductive loads such as motors!
- Sufficient current and voltage resistance is required.
- A heat sink may be required if the design is tight.
- Ensure that the input voltage range matches the supply voltage of the terminal adapter (12 or 24V).
- Cooling is often necessary for SSRs when high loads are switched, e.g. they are screwed to the control cabinet wall.

### Solenoid valve connection:

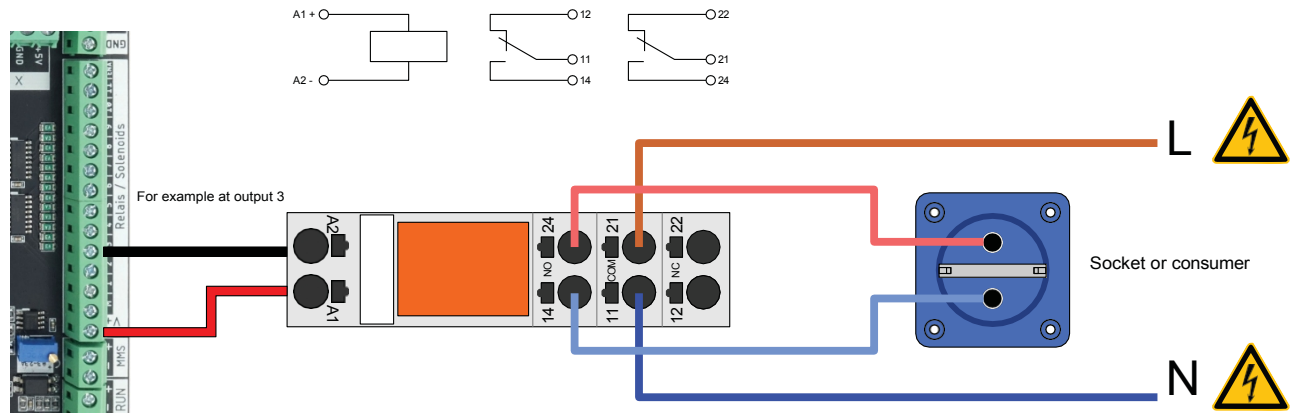
Solenoid valves behave like mechanical relays. This means that pneumatic clamping devices, for example, can be controlled quite easily via the terminal adapter. Observe the maximum permissible coil current of 200mA and the necessary freewheeling diodes!

### TIP:

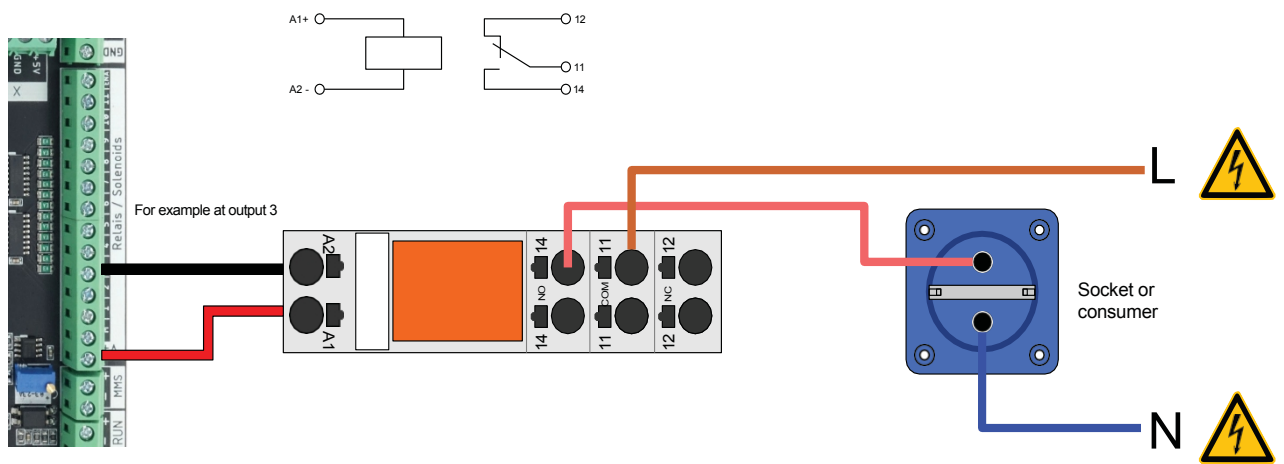
For consumers such as pumps, vacuum cleaners, spindles etc., it is very helpful to use **built-in sockets**. The relay is used to switch the mains voltage to the socket, the load is then simply plugged in and can be easily removed or replaced if defective. You will find switching examples on the next page. These sockets are also available in our store at [www.rocketronics.de](http://www.rocketronics.de)



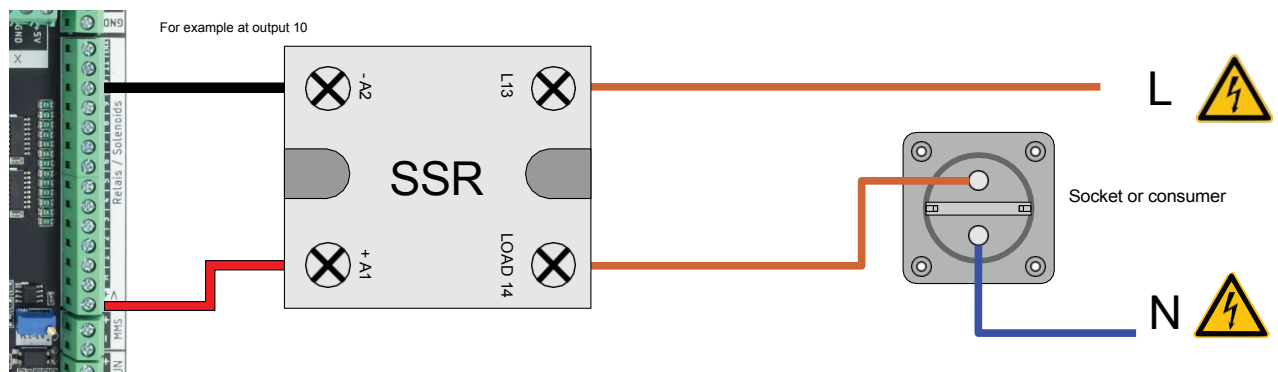
## Connection of coupling relays with 2 changeover contacts (e.g. Wago 788-312):



## Connection of coupling relays with 1 changeover contact (e.g. Wago 788-304):



## Connection of solid-state relays (e.g. Finder 77.25.9.024.8250 with 24V input):



### DANGER

- Only qualified electricians may work independently on electrical systems!
- The mains voltage must always be protected with fuses.
- Only use cables that are also approved for mains voltages

**MQL / minimum quantity lubrication:**

The "MMS" connection supplies precisely timed current pulses which can be used to control fuel injection valves or auxiliary heating metering pumps, for example. This enables very precise and repeatable dosing of coolants and lubricants. The output has an adjustable current limit to prevent the valve or pump from overheating. It is therefore also possible to operate 12V valves and pumps with 24V supply voltage without any problems.

Setting the current limit:

- Click on the "Image" button and select an icon to activate the lubrication cooling function in Estlcam.
- This button then also appears in the top left-hand field of the control unit.
- Set 2Hz in the "Spray pulses" field and 20ms in the "Spray pulse length" field.
- Start the spray cooling function by clicking on the button.
- Turn the potentiometer behind the "MMS" connections counterclockwise until the valve or pump starts to work ("knocking") and then a little further.

## **CONNECTION OF A SPINDLE OR A FREQUENCY INVERTER**

The adapter has an analog output with 0-10V "RPM" and a digital PWM output "PWM". These outputs are used to provide a control signal for setting the spindle speed. Some spindles require the analog 0-10V signal, others the digital PWM signal with 5V signal level.

There are spindles with integrated electronics and others that require an external frequency converter. What they all have in common is that you usually have to set parameters first, for which you need to consult the manual.

It is then important to ensure that the adapter signals are connected to the correct terminals on the converter, as an incorrect connection can cause major damage.

The terminal adapter can directly control most commercially available frequency inverters:

- Relay output "M" provides a switching output for a relay with which the spindle can be switched on. This means that a START/STOP input of an inverter can also be switched potential-free via a relay.
- The terminal pair "RUN+" and "RUN-" provides a potential-free switching contact (open collector optocoupler output) via which a digital input of the FI can be switched to start the motor.
- The "RPM" and "GND" terminals provide a calibratable 0-10V analog signal that can be used to control the speed of the motor.
- Always calibrate the speed output first - see below!
- Unfortunately, the terminal markings on the frequency inverters vary greatly depending on the manufacturer and type.
- Almost all frequency inverters are parameterized to start/stop via their own control panel when delivered!
- Start/stop via the terminal adapter is usually only possible after the parameterization has been adjusted accordingly (depending on the manufacturer and type). As a rule, only a look at the manual will help.
- VSDs with a potentiometer in the control panel are usually parameterized for speed control via their own potentiometer when delivered. Here, too, it is usually necessary to adjust the parameters first, sometimes even to reconnect jumpers inside the FI.

We recommend decoupling the switching signals to the inverter using relays. Use the "Spindle" output to switch a relay and then use its contact to switch the input of the inverter.

### **Important:**

ALWAYS use a mains filter upstream of frequency inverters and spindles! This prevents high-frequency interference from being fed into the mains and interfering with communication with the PC. The use of mains filters is required by law. ALWAYS use shielded cables between the inverter and spindle and earth all parts to one point in a star configuration.

### **Frequency inverter start / stop output:**

The "RUN" output is a potential-free optocoupler output for switching digital inputs of frequency inverters, so that no additional relay is required.

Connections:

- RUN-: Negative connection
- RUN+: Positive connection

The connection designations on frequency inverters are very different and should be checked in the manual. can be looked up. However, these are often:

"FOR", "FWD", "RUN" of the frequency inverter to RUN+ of the adapter.

"GND", "XGND", "DCM" of the frequency inverter to RUN- of the adapter.

## PWM and 0-10V speed outputs:

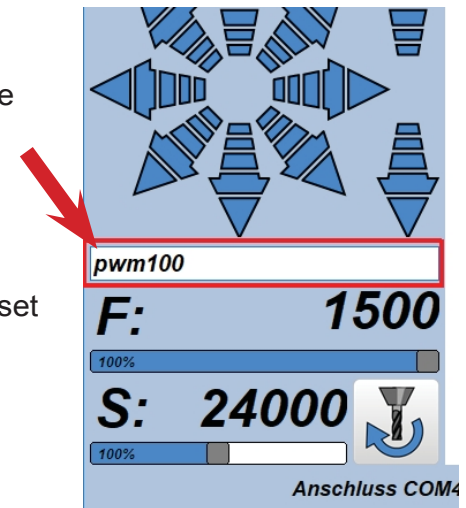
Connections:

- "GND" ground connection / 0V.
- "RPM" 0-10V analog signal e.g. for frequency converters (calibration required! - see below).
- "PWM" 5V PWM signal.

## Calibrate RPM 0-10V output:

The 0-10V signal can be finely adjusted with the small blue trimmer on the right. This setting must be made by the user. For calibration, the adapter must be supplied with power and configured in Estlcam.

- Nothing should be connected to RPM before calibration is complete.
- Start the control system.
- Type "**pwm100**" into the command line of the control unit and press the "Enter" key.
- The "Spindle" button in the software must change from blue to red.
- Now measure the voltage between "GND" and "RPM" with a multimeter.
- The terminal screws must be tightened before the measurement: Open terminals have poor contact!
- Turn the screw on the blue potentiometer behind the "RPM" terminal to set the voltage to 10V
- Turning clockwise reduces the tension.
- Turning counterclockwise increases the tension.
- Be careful not to slip with the screwdriver (risk of short circuit).
- Done - now a frequency inverter etc. can be connected.



Fine adjustment:

- If the spindle speed deviates significantly from the specification, you can make a fine adjustment during operation by turning the potentiometer.
- Take care not to cause a short circuit or get too close to components carrying dangerous voltages!
- However, deviations of 1-2% are normal and not relevant in practice.

## Connect frequency inverter speed signal:

The connection designations on frequency inverters are very different and should be checked in the manual. can be looked up. However, these are often:

- "VI", "Vin", "10V IN" of the frequency inverter to RPM of the adapter.
- "GND", "AGND", "ACM" of the frequency inverter to GND of the adapter.

## CONNECTION AMB / KRESS MILLING MOTORS

with external speed control

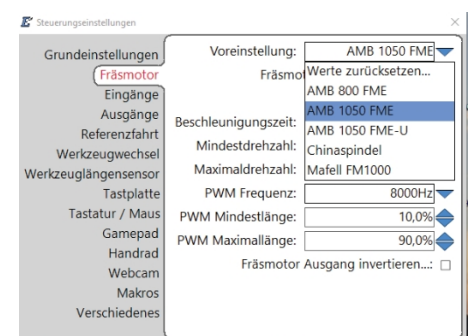
### 1. Configure software

- Go to the CNC control settings -> Milling motor.
- Select your milling motor from the "Preset" list.

### 2. Connect the milling motor:

- First stop Estlcam and de-energize the terminal adapter. Then connect as follows:

- Connect the white wire to "GND".
- Connect the green wire to "RPM".
- Connect the brown wire to "V+" (there are several of these on the adapter - it doesn't matter which one).



- Connect the milling motor to the socket.
- Reapply power to the terminal adapter.
- Start Estlcam.
- Set the switch on the milling motor to "on" - be aware that it may start up unexpectedly if something is set incorrectly!
- The milling motor should now be able to be switched on and off and its speed controlled via Estlcam.

## Connection of frequency inverters

The terminal adapter can directly control most commercially available frequency inverters:

- The terminal pair "RUN+" and "RUN-" provides a potential-free switching contact (open collector optocoupler output) via which a digital input of the FI can be switched to start the motor.
- The "RPM" and "GND" terminals provide a calibratable 0-10V analog signal that can be used to control the speed of the motor.

### **Important: Calibrate the speed output first, see above!**

Unfortunately, the terminal labels of the frequency inverters vary greatly depending on the manufacturer and type. Almost all frequency inverters are parameterized to start/stop via their own control panel on delivery; start/stop via the terminal adapter is usually only possible after the parameterization has been adapted accordingly (depending on the manufacturer and type).

FIs with potentiometers in the control panel are usually parameterized for speed control via their own potentiometer when delivered; here, too, it is usually necessary to adjust the parameters first, sometimes even to reconnect jumpers inside the FI.

### **Connection examples / without guarantee - at your own risk:**

Huanyang Hy... Series:

- "RUN+" -> "FOR"
- "RUN-" -> "DCM"
- "RPM" -> "VI"
- "GND" -> "ACM"
- Parameter 1: "1"
- Parameter 2: "1"
- Parameter 72: "400"
- Parameter 73: "100"
- If potentiometer in the control panel: Move jumper from "VR" to "VI".

YL620:

- "RUN+" -> "FWD"
- "RUN-" -> "XGND"
- "RPM" -> "VI1"
- "GND" -> "GND"
- Parameter 00.01: "1"
- Parameter 07.08: "3"

A2 Inverter (China Noname):

- "RUN+" -> "FWD"
- "RUN-" -> "GND"
- "RPM" -> "10V IN"
- "GND" -> "GND"
- Parameter Pn 03: "4"

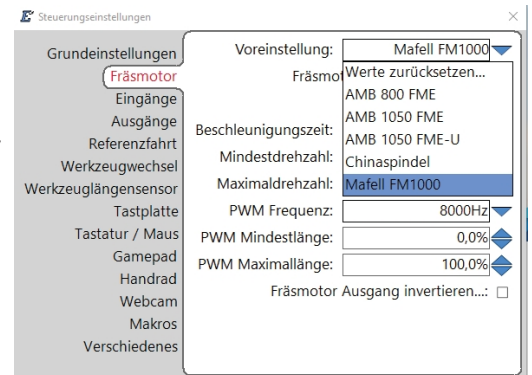
## CONNECTION OF MAFELL MILLING MOTORS WITH EXTERNAL SPEED CONTROL

### 1. Configure software

- Go to the CNC control settings -> Milling motor.
- Select Mafell MF1000 from the "Preset" list.
- Or manually enter the minimum and maximum speed of your milling motor in the fields for lower and upper speed limit.

### 2. Connect the milling motor:

- First stop Estlcam and de-energize the terminal adapter. Then connect the spindle as follows:



Pin no.	Parameters	Color	Connection to terminal adapter
1	UPV	BROWN	V+ or one of the (A1) terminals of the relay outputs
2	US	WHITE	RPM
3	U0	BLACK	Do not clamp, insulate well!
4	GND	BLUE	GND

To do this, the mains voltage must be switched to the spindle via a relay; the best way to do this is via a socket whose phase is switched via a relay. To do this, connect a relay to the "Spindle" output and connect terminal A1 of the relay to terminal A1 of the output "Spindle" and A2 accordingly with A2 of the "Spindle" output. Now switch the mains voltage to a socket via the relay's switching contact. Plug the spindle plug into this socket. **See page 19.**

Once the connection is ready, proceed as follows:

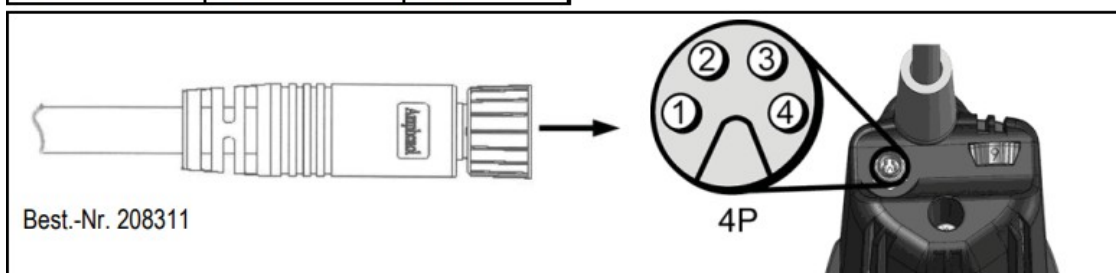
- Connect the milling motor to the socket.
- Reapply power to the terminal adapter.
- Start Estlcam.
- Set the switch on the milling motor to "on" - be aware that it may start unexpectedly if something is set incorrectly!
- The milling motor should now be able to be switched on and off and its speed controlled via Estlcam.

Please also refer to the spindle manual!

### 5.2.1 Belegung Portalstecker

Alle Pins am Portalstecker sind gegen Verpolen geschützt. Bei Spannungen über 30 V ist ein verpoltter Dauerbetrieb zu vermeiden, da es zum Ausfall der PV-Schnittstelle führen kann.

Pin Nr.	Parameter	Litzenfarbe Best.-Nr. 208311
1	U <sub>PV</sub>	Braun
2	U <sub>S</sub>	Weiß
3	U <sub>0</sub>	Schwarz
4	GND	Blau



## FIRST COMMISSIONING OF THE SOFTWARE:

- Download the software first, it can also be used without a license: It only works with version 12:  
64-bit version: [https://www.estlcam.de/downloads/Estlcam\\_64\\_12.exe](https://www.estlcam.de/downloads/Estlcam_64_12.exe)

You will then have 2 Estlcam icons on your desktop:

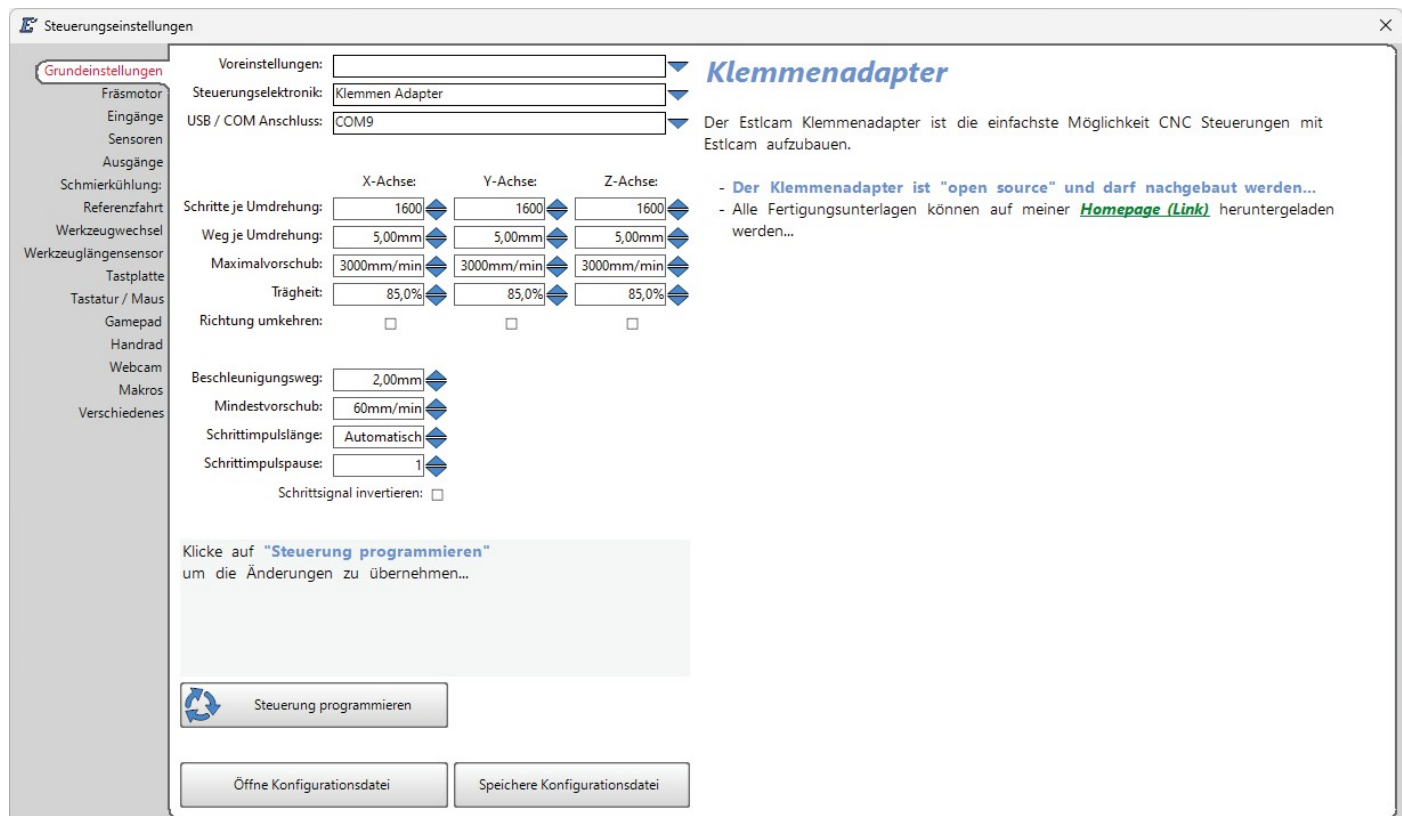
"Estlcam V12 CAM" for the CAM module from Estlcam...

"Estlcam V12 CNC" for the Estlcam control module...

Start the control unit by double-clicking on the "Estlcam V12 CNC" icon...

And then click on the "Fork wrench" button on the right-hand edge of the control window to open the control settings...

- Install the circuit board in the intended location, e.g. a switch cabinet or other suitable housing. **Please do not test on the plastic table top, as this can emit very high static discharges to the electronics and destroy them.**
- Do NOT connect anything yet.
- Connect a well-shielded USB cable with a maximum length of 2 m to the USB port on the control unit and plug the other end into a free port on a PC. The PC should now recognize a new device. If nothing happens, the driver may need to be installed. You can find this at: <https://tinyurl.com/2j7f542p> or on our website.
- In the software, open the settings window under Settings -> CNC control unit. There at "Control electronics" set to type "Terminal adapter" .



- Under USB/COM port, set the comport provided by the control unit, e.g. COM2. If you do not know the number, select "Search" and follow the instructions.
- Then click on "Program control unit" to test whether the control unit is responsive:
- Once the process is complete, the connection is established!
- Then disconnect the USB cable again first: **ALWAYS connect components with the USB cable disconnected and without power supply to the control unit.**
- You can then start connecting the components. It is best to do this bit by bit and test the function every now and then.

## **SETTINGS**

Basically, the software must be set to determine how the motors of the axes should move and how the inputs and outputs should be used. This is necessary for the machine to function correctly with the control system. You can also find online instructions for this at

**<https://www.estlcam.de/anleitung.php>**

**If settings have been changed, these must ALWAYS be transferred to the terminal adapter with "Program control"!**

The settings window has several tabs for basic settings, milling motor, inputs, outputs, etc. **If you hold the mouse over one of the input fields, a help text appears explaining everything.**

On the basic settings page, the number of steps/revolution, travel per revolution, maximum feed, inertia and direction reversal are set for each axis. These values must be adapted to the hardware.

### ***Steps per revolution:***

Is determined by the output stages / motor drivers. These are adjustable; the value set on the driver must also be entered here. The usual values are 400, 800 or 1600. 1600 is usually a good choice.

### ***Distance per revolution:***

Distance traveled per revolution of the stepper motor axis. Corresponds to the spindle pitch for threaded rods and ball screws. For toothed belts: Belt pitch x number of teeth of the belt pulley.

This is also an alternative entry for the step resolution (distance the axis travels per motor step): Set the value for steps per revolution to 1 and enter the step resolution in the distance per revolution field. The value will be displayed strongly rounded, or usually simply "0.00" will be displayed. However, Estlcam will still use the exact value entered.

### ***Maximum feed:***

This is the maximum speed of the axle, which depends on the performance of the drive components.

The theoretically possible maximum feed rate results from the maximum speed of the motor and the distance per revolution: If you have a servo motor that achieves 3000 rpm and a 5 mm spindle on the axis, you can theoretically move  $3000 \times 5 = 15,000$  mm/min. In reality, it should be less, you have to adjust this in real operation. Also remember: High speeds entail high risks! Set the value slowly to begin with.

Maximum feed and acceleration travel are closely linked:

Carry out tests with different acceleration paths to see how they affect the speed:

- Start with an acceleration path that corresponds approximately to the spindle pitch.
- Determine the achievable speeds of the individual axes: Increase the feed rate, reprogram the control unit and then try to move the machine at maximum speed.
- If this works without any problems, increase the feed rate further and try again.
- If the motor stalls, write down the value and repeat the test with a different acceleration path.
- At the end you can draw an X/Y diagram of the acceleration paths against the maximum speeds:
- You will notice that longer acceleration distances enable higher speeds, but also make the machine more sluggish.

- Shorter acceleration distances in turn improve the dynamics, but at the expense of the maximum speeds that can be achieved.
- There will be a certain range in which the acceleration paths correlate well with the feed rates. Outside this range, small improvements in one property will lead to disproportionate deterioration in the other. The curve bends at a certain point - a good compromise between speed and dynamics is usually achieved there.
- Subtract 20-30% safety reserve from the maximum achievable feed rates!

### **Inertia:**

Similar to cars, CNC milling machines cannot drive through bends at any speed without causing an accident or losing steps. The higher the inertia value, the more the machine is slowed down before changing direction in order to avoid step losses. The aim is to set the inertia as high as necessary to prevent step losses, but also to keep it as low as possible so as not to slow down the machine unnecessarily.

#### In the event of step losses:

Is it more of a gradual step loss during milling that slowly builds up over time? Then increase the inertia of the affected axis.

Are there sudden, severe step losses with complete standstill of an axis during a fast positioning run? Then reduce the maximum feed of the axis or increase the acceleration travel.

### **Further possible settings and optimization:**

For many power amplifiers, such as the Leadshine DM542EU, DM556, etc., the checkbox "**Step-invert signal**" can be set:

These output stages read in the direction signal on the rising edge of the step signal, which has not been present for long with a "normal" step signal. This can result in direction changes only being recognized at the next clock pulse and position deviations accumulating over time. The inversion ensures that the change of direction is output on the falling edge and is then correctly present for much longer on the next rising edge. If there are problems with creeping position deviations, the "Invert step signal" checkbox should be the first port of call.

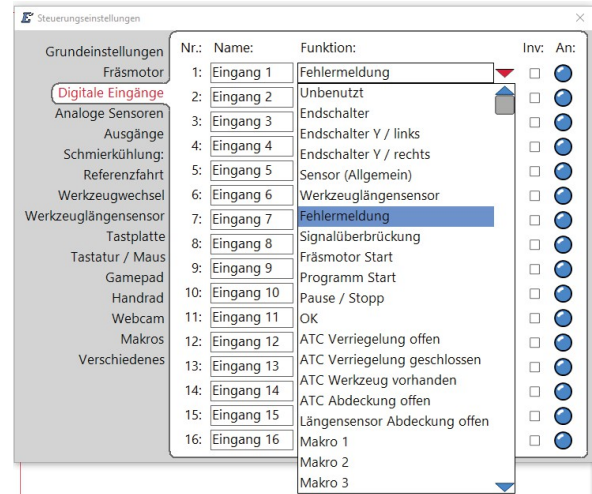
For output stages that require even more time between the change of direction signal and the next cycle, the time in the "**Step pause**" field can be increased further. However, this only affects a few output stages with particularly slow optocouplers on the direction signal. The value should not be set unnecessarily high as the field has a negative effect on running smoothness.

Some output stages only work reliably with step pulses within a certain length.

This can be set in the "**Step pulse length**" field. As a rule, however, the "Automatic" setting is best. Only output stages with a very low maximum input frequency are affected by this problem.

## CONFIGURATION OF THE INPUTS:

For an input to perform the desired task, it must be configured accordingly in the configuration of the control unit. This can be done in the software under Settings -> CNC control. Select the "Inputs" tab in the window. The function can be set there for input 1 - 16:



### Possible functions of the inputs

#### Unused

For unused inputs. Unused inputs are hidden in the control window.

#### Limit switch

For limit or reference switches:

It does not matter whether there are 0, 1 or 2 limit switches per axis.

If there is a lack of inputs, several limit switches can be connected to one input at the same time.

#### Limit switch Y / left" and "Limit switch Y / left

Only available for hardware with axis alignment function!

If the Y-axis of the machine is driven by a left and right motor and limit switches are mounted on both sides, the machine is automatically aligned during the reference run.

#### Sensor

For sensors such as tool length sensor, touch plate, etc.

#### Tool length sensor

For sensors such as the tool length sensor, this input is ONLY monitored during length measurement!

#### Error message

For critical errors that should trigger an immediate stop of all axes and the milling motor: This is the brute force method to stop the machine abruptly, which usually leads to step losses. See also the "Pause / Stop" function as a milder alternative.

ATTENTION: NO "EMERGENCY STOP"! It is a software function that cannot provide 100% protection! If a real emergency stop is required, this must be implemented using suitable hardware; the error message signal can only be used as an optional additional measure.

#### Signal bypass

Used to bypass the limit switch, sensor and error messages in order to machine manually from the triggering switch or sensor if required.

#### Milling motor start

Starts and stops the milling motor.

#### Program start

Starts and pauses the CNC program.

#### Pause / Stop

Stops the milling motor / Pauses CNC programs.

#### OK

Cancel axes / confirm selection etc..

### **MAKRO up to 10**

Starts macros 1 to 10...

### **Other**

For everything else. Has no function, but the status of the input is displayed in the control window.

The blue "LED" next to the input indicates the current status of the input, which is helpful in the event of a fault.

However, the configuration should only be carried out at the end after successful commissioning. otherwise Estlcam may overwrite everything with the default settings.

### **Important:**

- Unused inputs should also be configured as "Unused".
- The "Invert" checkbox must be ticked for openers!
- "Limit switch", whether mechanical or inductive sensor, always set as "limit switch", not as sensor!
- A "sensor" is, for example, a length measuring sensor, edge finder, etc.
- We use the "Error message" type for error signals
- Push-buttons for starting or stopping a program can be connected, the input must be can then be configured as "Program Start" or "Program Stop".

**If settings have been changed, these must ALWAYS be transferred to the terminal adapter with "Program control"!**

## **The ESTLCAM license**

The software can be used free of charge for test purposes. The free version is fully functional. It only pauses for longer periods of time when opening and saving certain files.

**However, a license is required for permanent use.**

The freeware version of the software is unlocked by entering the license key for the full version. After entering the license key, the software is unlocked and there are no more waiting times with instructions for purchasing a license.

Version 12 License keys can be used on a maximum of 3 computers simultaneously by default and also work for the older version 11. Licenses that are no longer used on old computers can be deactivated and then transferred to a new one. This also works if the old PC no longer exists or is defective.

You can enter the license key on the same PC (e.g. after new installations) as often as you like.

***Order your license code now from Rocketronics:***

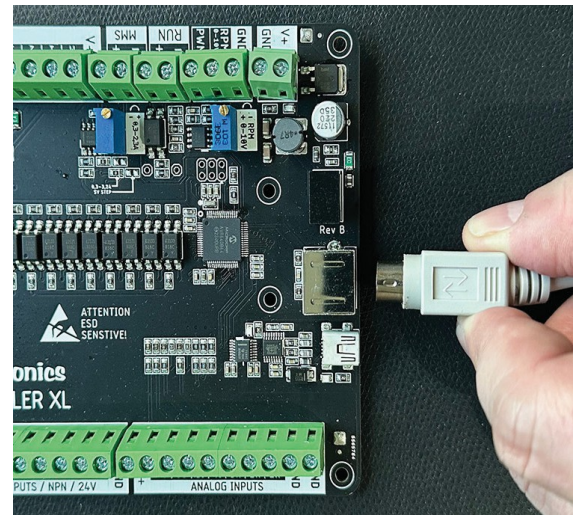
<https://www.rocketronics.de/shop/de/estlcam-lizenz.html>

## **CONNECTION OF ADDITIONAL MODULES TO THE MINI-DIN CONNECTOR:**

The Mini-DIN socket is primarily used to connect ready-made additional modules, including the following

- The Estlcam handwheel
- The Estlcam control panel.
- The potentiometer and push-button module.

In principle, however, you can also make your own. You can find more information about the mini-DIN socket here:  
[https://www.estlcam.de/DIN\\_Detail.php](https://www.estlcam.de/DIN_Detail.php)



## **Handwheel for Estlcam for easy control of all 3 axes**

Fits the Estlcam terminal adapter and the Estlcam LPT adapter!

- Pre-assembled robust handwheel for Estlcam.
- With joystick for very sensitive movement of all 3 axes.
- With encoder wheel for step-by-step movement of all 3 axes.
- Illuminated button for zeroing the axes.

It also has 2 potentiometers, one for setting the spindle speed and one for the feed speed; the potentiometers can also be pressed as they have a push-button function to start and stop the spindles and start programs.

Supplied with 3m flexible cable, packed in cardboard box, with printed operating instructions. Technical

data:

- Dimensions: 185x98x95 mm (LxWxH)
- 3 m long cable with bend protection
- MINI-DIN connector for Estlcam hardware
- Joystick and encoder wheel for movement of all 3 axes
- Including protective rubber pad
- Ready to use.



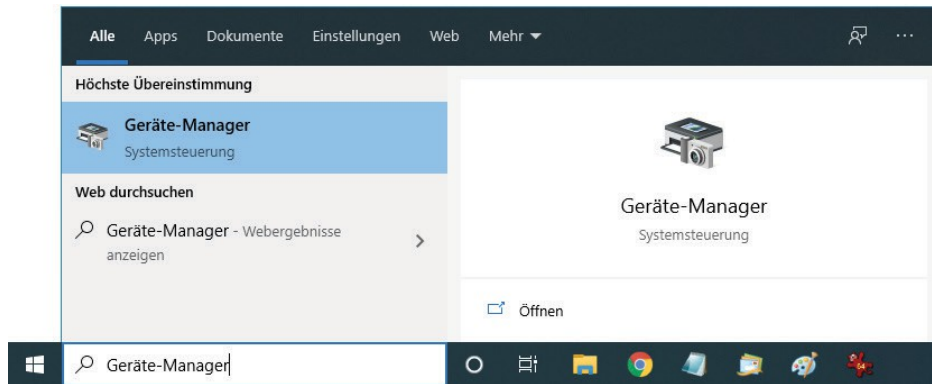
## **Order now:**

<https://www.rocktronics.de/shop/de/estlcam-handrad.html>

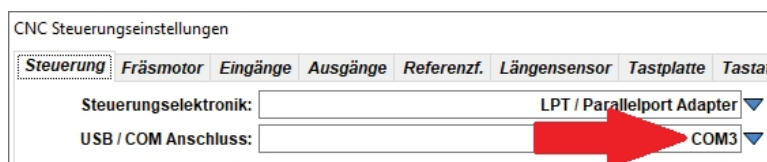
## VERY IMPORTANT - INCREASE USB COMMUNICATION SPEED :

By default, the USB driver checks every 16ms whether data needs to be transferred from the controller. This is sufficient in principle, but is not optimal. To optimize the responsiveness of the control unit, do the following:

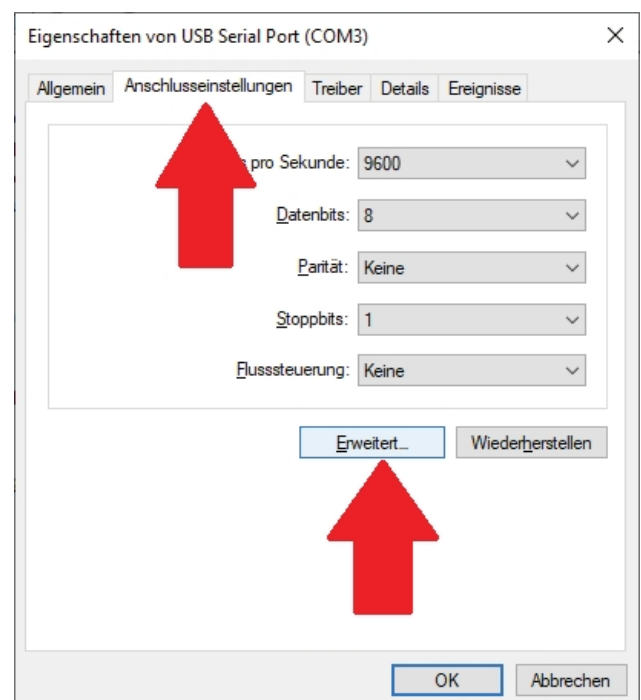
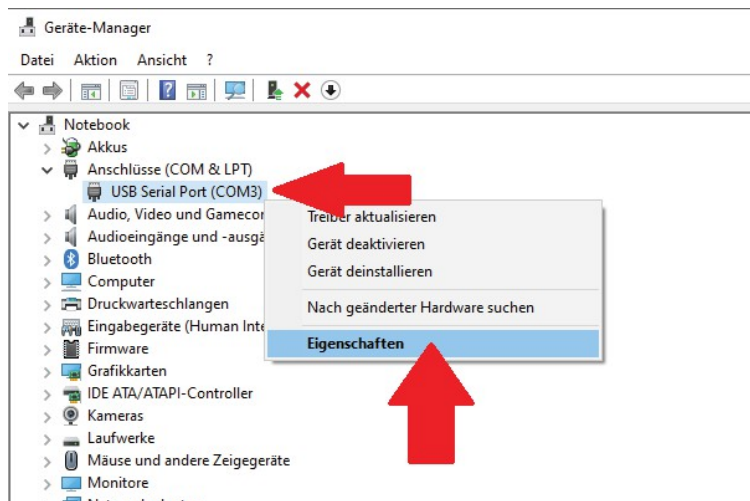
With the terminal adapter connected, open the Device Manager (e.g. enter "Device Manager" in the Windows search bar or call it up via "Control Panel" -> "System and Security" -> "Device Manager"):



Check in Estlcam which "COM" port is entered under "USB / COM port:". In our example, this is "COM3":



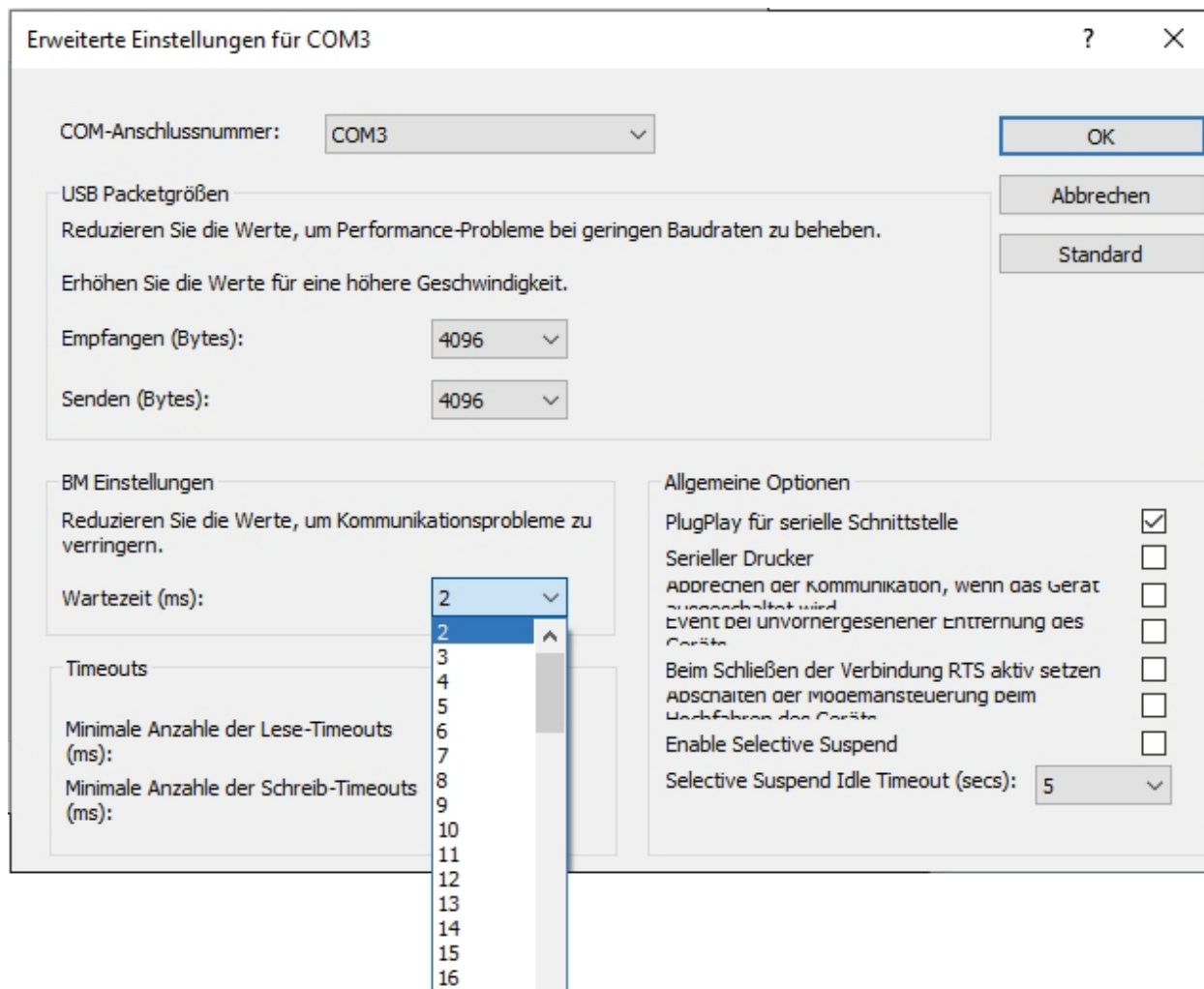
Search for a "USB Serial Port" with this "COM" number under "Ports (COM & LPT)". In our example "USB Serial Port COM3". Right-click on this entry and select "Properties" from:



Select the "Connection settings" tab and click on "Advanced":

## Increase communication speed:

Change the value for the "Waiting time" to 2ms and click OK to save.



## TIPS: ELIMINATE USB MALFUNCTIONS

If the connection to the controller is interrupted with a USB error, you can check the following:

1. Check whether a well shielded short USB cable has been used. It should never be longer than 2m, shorter is better.
2. Earth power supply units at the earth connection if available.
3. Metallic parts of the machine should always be connected to earth.
4. Bring all underground cables together at one point in a star shape.
5. Are all control cables to the motors shielded?
6. Cables from driver to motor and frequency inverter to spindle MUST also be shielded.
7. Do not use cables for power supply and as control cables at the same time, use separate cables and do not lay them directly next to each other in parallel: cables can induce voltages in other cables through current flow, even if they are shielded. This can easily generate a few volts, which can lead to incorrect control commands.
8. Always install a suitable mains filter upstream of the frequency inverter; this is absolutely essential.
9. Place power components such as frequency inverters, power supply units and drivers as far away from the control unit as possible. Frequency inverters can quickly cause interference directly next to the control unit.
10. Lay control cables as far away as possible from frequency converters and the cables leading to them.
11. The shield of the cables may only be connected to earth on one side of the cable.

Visit us at [www.rocketronics.de](http://www.rocketronics.de)

On the Rocketronics website you will find lots of information, data sheets and new software for the products.

We also offer high-quality accessories for lathes and milling machines in our store. These include drives, output stages, power supply units, couplings, cables, adapters, encoders and much more. We supply detailed connection drawings for all motor/power stage combinations!



Closed-loop stepper



Servomotors



Power supply units



Motors and drivers



Cables, terminals, connectors



Accessories

## DO YOU HAVE A LATHE? THEN MAYBE THE ELS4 IS SOMETHING FOR YOU!

The electronic lead screw control is a simple cycle control for lathes. We offer two variants:

### The **ELS4 Basic**

for DIY enthusiasts and occasional filming work

### The **ELS4 Pro**

for the ambitious turner and workshops.

#### Advantages:

- Free feed selection
- No more changing wheels!
- Automatic thread turning in all shapes
- Cones, radii, recesses
- Grinding and shaping
- Drilling
- Very easy to use
- Autonomous without PC

The ELS4 is integrated into an existing lathe, which must be equipped with a **spindle encoder** and two **drives** on the X and Z axes. The ELS4 then offers you free feed selection and many automatic functions such as thread turning, taper and wheel turning and much more.



ELS4 PRO

An electronic spindle control is a control system used to position and drive a spindle, a type of linear drive that converts rotary motion into linear motion. The electronic spindle control usually consists of a drive motor, a control unit and an encoder. The control unit sends commands to the motor to rotate the spindle at a certain speed and in a certain direction, and the encoder provides the control unit with feedback on the position of the spindle. The electronic lead screw controller uses this feedback to adjust the motor speed and direction as needed to precisely control and synchronize the lead screw position.



ELS4 Basic

If you previously had a gearbox with change gears, with the ELS you will **never** have to **change change gears again**: you simply set the desired feed rate!

Many enthusiastic customers rely on the ELS, which also transforms your machine into a completely new tool.

Please also note our conversion packages with all parts required for are required for a conversion. You can find these in the store.

Comprehensive information on the system can be found on our information website at

<https://www.rocketronics.de/els>



# THE ESTLCAM HANDWHEEL

---

Fits the Estlcam terminal adapter and the Estlcam LPT adapter!

- Pre-assembled robust handwheel for Estlcam.
- With joystick for very sensitive movement of all 3 axes.
- With encoder wheel for step-by-step movement of all 3 axes.
- Illuminated button for zeroing the axes.

It also has 2 potentiometers, one for setting the spindle speed, one for the feed speed, and the potentiometers can also be pressed as they have a push-button function to start and stop the spindle and start programs.

Supplied with 3m flexible cable, packed in a cardboard box, with printed operating instructions.

Technical data:

- Dimensions: 185x98x95 mm (LxWxH)
- 3 m long cable with bend protection
- MINI-DIN connector for Estlcam hardware
- Joystick and encoder wheel for movement of all 3 axes
- Including protective rubber pad
- Ready to use.

**Order now:**

<https://www.rocketronics.de/shop/estlcam-handrad.html>



 **Rocketronics**

**Hugo-Grotius-Str. 18 27404 Zeven Germany**

Phone + Whatsapp: +49/(0)4281/ 50 79 78

2 info@rocketronics.de●

www.rocketronics.de