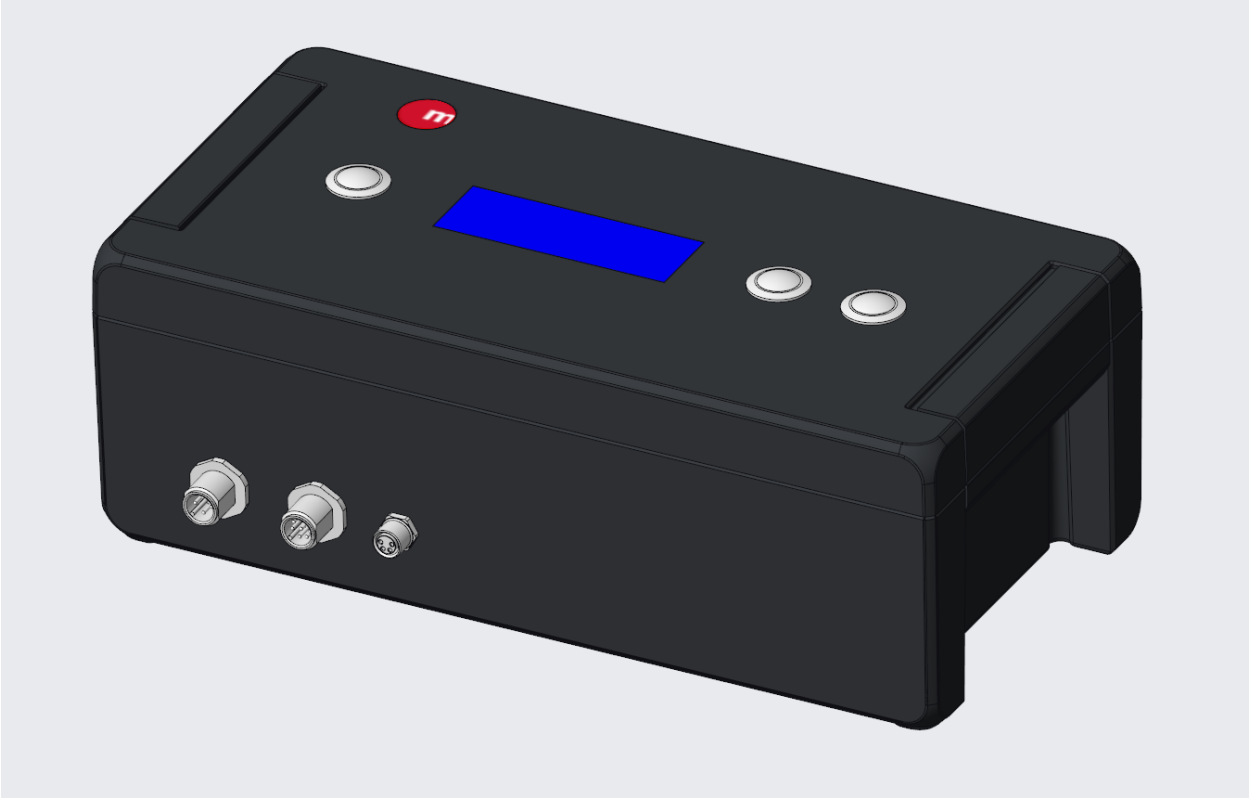
# Operating instructions
## I/O Box



Maprox AG
Usterstrasse 87
CH-8620 Wetzikon
www.maprox.ch

German Original Document Operating Instructions I/O Box

## Important information

This operating manual contains important information for the commissioning, operation, maintenance and disposal of the system. You will also receive information and important information about your safety and help with problems. The operating instructions are part of the system and must be given when passing it on.

The operator of this system is responsible for ensuring that the instructions and instructions in this manual are read, understood and followed by the personnel prior to the commissioning of the system.

## Copyright



## Disclaimer

The manufacturer declines any liability for damage caused by disregard of the instructions and instructions listed in the operating instructions.

This applies in particular to:

- Damage caused by improper use and incorrect operation.
- Damage caused by disregard of safety-relevant information in the operating instructions or warnings affixed to the device.
- Damage caused by inadequate or non-performing maintenance work.

Unauthorized modifications and modifications to the device can affect safety and are not permitted. This can lead to product compliance no longer being met.

# 1 Table of Contents

Version

| Version | Created by | Condition | Date |
|---|---|---|---|
| V1.0 | RaKl, ThFl | Rebuilding | March 25 |

| | | | |
|---|---|---|---|
| V1.1 | RaKl | Addendum/Adjustment Menu Navigation IO Box, Adjustment Force | |
| V2.0 | DoCo | Standalone document for I/O box | November 2025 |
| V2.1 | RoEh | Adjustments to software version 1.1.0 | January 2026 |

# 2 Identification

## 2.1 Contact information

Maprox AG
Usterstrasse 87
8620 Wetzikon
Phone +41 43 488 18 00
E-Mail info@maprox.ch
Internet www.maprox.ch

## 2.2 Explanation of the presentation notes

**Danger**
Indicates an imminent danger that can lead to the most serious bodily injury, damage to health or death.

**Warning**
Indicates a possible imminent danger that can lead to serious bodily injury, damage to health, death or significant property damage.

**Important**
Refers to application and operating instructions and other useful information.

**Commissioning and maintenance personnel**
Sections with this symbol mainly concern commissioning and maintenance personnel. The specified work may only be carried out by trained personnel.

## 2.3 Text formatting

Controls or modes of operation are printed *in italics*.
Example: Press the *Start* button .
A sequence of steps in the operation is shown as follows:
► Press 1 button *START*
► 2 Select operating mode

# 3 System description

## 3.1 Description

The I/O box is a control option for the E-Chuck series from Maprox AG.

It enables communication with machine controllers via digital and analogue input and output signals.

## 3.2 Specifications

| | |
|---|---|
| **Dimensions** | |
| Dimensions (L x W x H) | 260mm x 128mm x 90mm |
| Weight | 2 kg |
| **Power supply** | |
| Communication interface | CANopen |
| Voltage | 24 V DC |
| Current (Peak) | 10 A |
| **Environment** | |
| Operating temperature | 15 … 40 °C |
| Storage Temperature | 0 … 40 °C |
| Humidity (non-condensing) | 20 … 80 % |

# 4 Overview

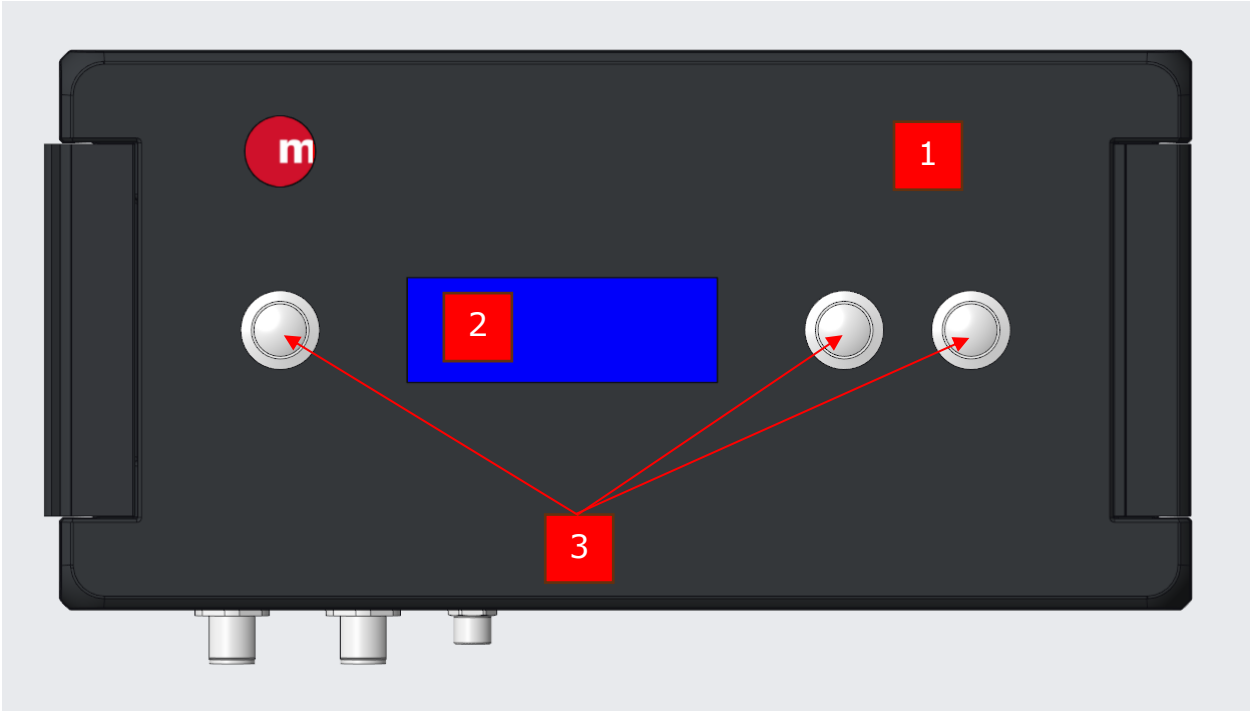



Figure 1: Module Overview

**Legend:**

1. I/O Box
2. Display
3. Control buttons

## 4.1 I/O Box

Figure 2: I/O Box

The I/O box is the interface between the E-Chuck and the machine. You can operate the E-Chuck fully automatically as well as manually. It has three buttons for manual operation *: open, close, reset* as well as a display on which the current clamping force and the clamping mode (outer or inner clamping) is shown.

| No. | Module |
|---|---|
| 1 | I/O Box |

## 4.2 Control buttons

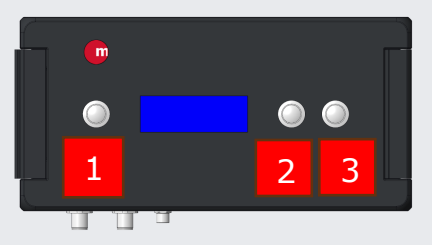



Figure 3: I/O Box

1 = Change menu
2 = Option left
3 = Option right

| No. | Module |
|---|---|
| 3 | Control buttons |

# 5 Basic safety instructions

The following basic safety instructions must be observed when operating the system. Safety regulations for operation and maintenance are listed in the corresponding chapters and must be strictly observed!

## 5.1 Personal Qualification

The E-Chuck may only be operated by instructed and trained personnel. The operator of the system must confirm in writing that he:

- has read and understood the operating instructions,
- has received an introduction to the safe operation of the system,
- knows the operating regulations.

Maprox AG declines any responsibility if the machine is used for a purpose other than that described here.

## 5.2 Environment

The system must be operated in a well-lit environment. There must be enough space around the operating front for the operating personnel to operate the system freely

## 5.3 Improper use

- Use without training.
- Use in machines with higher force (e.g. machine tools)
- Operation in disregard of safety regulations.
- Operation outside the limits specified in the *technical data* of the operating instructions.
- Operation in disregard of local accident prevention regulations and industrial safety regulations.
- Operation with defective device parts and components.
- Repairs by unauthorized persons (warranty claim or product conformity may expire).
- Replacement of defective components with components that are not suitable or not specified by the manufacturer.

## 5.4 Predictable misuse

- When inserting the workpieces or removing them by hand, there is a risk of crushing between the loaded parts and the jaws. When loading and unloading the system, you must never reach between the jaws and the workpiece or there must be no part of the body in the danger zone.

  The operator is responsible for ensuring that no body parts are in the danger area.

## 5.5 Personal Protective Equipment, Training

The user must wear the personal protective equipment in accordance with the country-specific legal or internal accident prevention regulations.

## 5.6 Suggestion for an operating instruction

Operating instructions are regulations that an entrepreneur creates for the safe operation of the company. These are binding instructions issued by the entrepreneur. Employees are obliged by accident prevention regulations to follow these instructions.

The general obligation of the entrepreneur to prepare and publish operating instructions must be derived from the accident prevention regulation "General Regulations". According to this provision, the employer must issue orders to prevent accidents at work and it is required that the employer must inform the insured persons about the risks arising from their activities and about the measures to be taken to avert them.

The entrepreneur can meet these requirements with the help of operating instructions.

The operating instructions presented here are therefore intended to supplement national regulations on accident prevention and environmental protection!

**The employee must be given information about:**

- The operator must undertake to operate the system only in perfect condition.
- The hazards arising from the handling of the substances used and the necessary protective measures as well as the rules of conduct, including instructions in the event of danger and first aid.
- Type and scope of regular inspections for safe working conditions
- Maintenance
- Rectification of operational disruptions
- Environmental protection
- The user company must ensure cleanliness and clarity at the workplace by means of instructions and controls.
- The responsibilities for operation and maintenance must be unambiguously regulated by the user company and adhered to by all persons so that no unclear competences arise from a safety point of view.
- The operator is obliged to immediately report any changes to the system that affect safety to his superior.
- Appropriate information and warning signs to be observed
- The operator must also ensure that no unauthorized persons are present at the system.

## 5.7 Operational safety

Do not **start the system** if:

- Electrical connections on the system have defects

# 6 Preparing the system for use

## 6.1 Site requirements

The installation site must have a level surface. The substrate must be dry and hard.
The pitch dimensions must at least correspond to the information in the technical data on the surface area used.

## 6.2 Setting up and aligning

**Transport**
The I/O box is packaged and shipped separately from the E-Chuck.
Remove the transport packaging.

**Place**
Place the I/O box on a flat surface.

**Connecting the E-Chuck**
The I/O box according to chapter 6.3 with the E-Chuck and the machine.

## 6.3 Connection to the machine-side supply

The cable tail of the E-Chuck can be extended to M8x1 (4-pole, A coded, male) with an M8x1 (4-pole, A coded, male). Maximum length is 5m.

To connect the E-Chuck to the I/O box, you can connect directly to X3 of the I/O box.

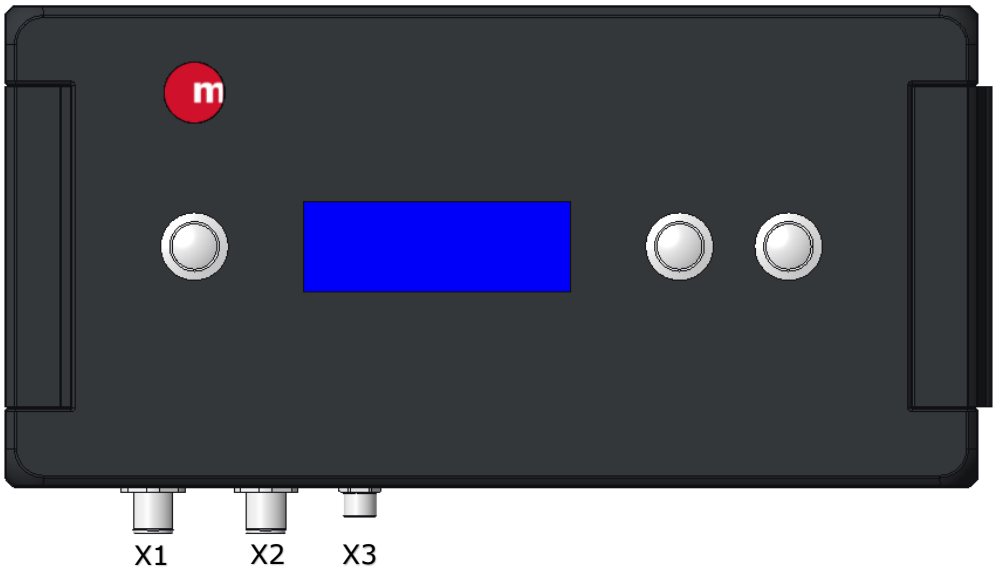



Figure 4 I/O Box Connections

### 6.3.1 Connecting the I/O Box

**X1 – Power**
M12x1 (4-pole, A-coded, flange plug)

**DANGER!**
The *24V power supply* is to be switched off by the customer via the emergency stop.

| PIN | Connection | Cable color |
|---|---|---|
| 1 | 24VDC Power | Brown |
| 2 | GND Power | White |
| 3 | GND | Blue |
| 4 | 24VDC Control | Black |

| | |
|---|---|
|  | **Information**<br>The GND Power and GND potential are not isolated. |
|  | **WARNING!**<br>Connection to the on-site supply may only be carried out by qualified personnel. The machine must not be put into operation with temporary connections. |

**X2 – Signal**
M12x1 (8-pole, A-coded, flanged connector)

| PIN | Connection | Type |
|---|---|---|
| 1 | Reset (Reset) | Input (Digital) |
| 2 | Tightening (Close) | Input (Digital) |
| 3 | Open | Input (Digital) |
| 4 | Error | Output (Digital) |
| 5 | Busy (Busy) | Output (Digital) |
| 6 | Done (Done) | Output (Digital) |
| 7 | Clamping Force | Input (Analog) |
| 8 | Direction | Input (Digital) |

Digital inputs (24VDC – active / 0VDC – inactive)
Analog inputs (1 VDC -9 VDC)
Digital outputs (24VDC – active / 0VDC – inactive)

**X3 – E-Chuck**
M8x1 (4-pole, A-coded, flanged socket)

| PIN | Connection | Cable color |
|---|---|---|
| 1 | 24VDC | Brown |
| 2 | CAN High | White |
| 3 | GND | Blue |
| 4 | CAN Low | Black |

The X3 connector may only be connected to an E-Chuck.

## 6.4 First commissioning

Before starting for the first time, familiarize yourself with the remaining chapters of this operating manual. Make sure that everyone has followed and executed work and instructions.

# 7 Sources of danger

## 7.1 Mechanical hazards

When inserting the workpieces or removing them by hand, there is a risk of crushing between the loaded parts and the jaws. **When loading and unloading the system, you must never reach between the jaws and the workpiece or there must be no part of the body in the danger zone.**

**The operator is responsible for ensuring that no body parts are in the danger area.**

#### 7.1.1.1 WARNING!

This machine has moving parts. No covers and safety precautions may be removed.

## 7.2 Electrical hazards

**Electric shock:**
For all electrical work, the machine must be switched off at the main switch of the main control cabinet and secured against reactivation with the appropriate LOTO method. The covers for the electrical installations can only be removed when the power is de-energized.

# 8 Operation

## 8.1 Semi-automatic operation of the E-Chuck via I/O box

The E-Chuck can be operated semi-automatically with the I/O box without external control. All you need to do is connect the electrical connection (X1) and the E-Chuck (X3) (see chapter 6.3).
By pressing the corresponding buttons, the E-Chuck is operated.

- *P1*: Cycles through the menu
- *P2:* Left Option
- *P3*: Right option.

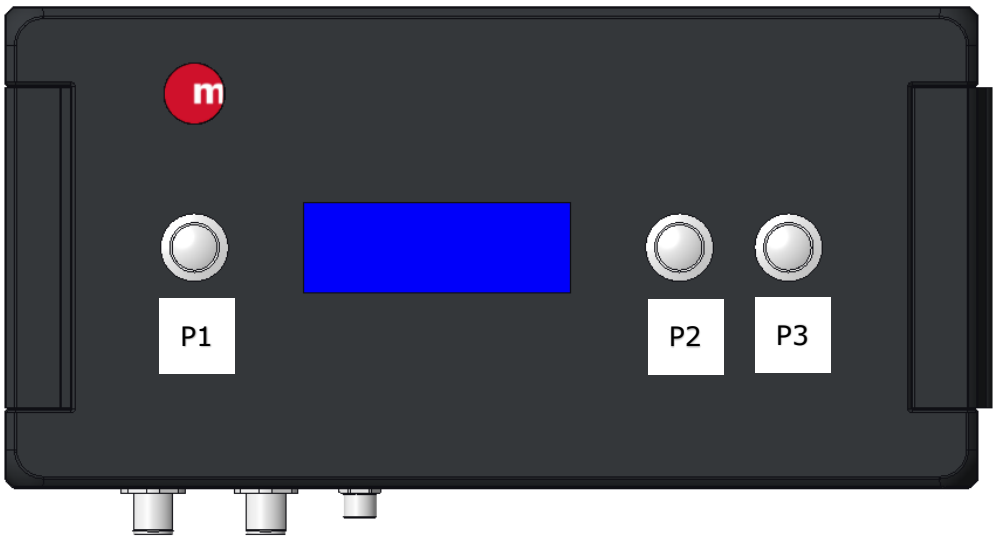
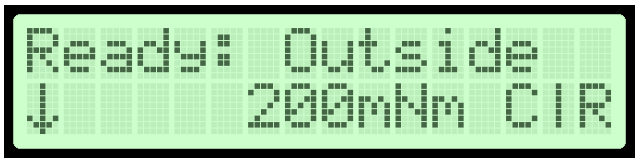



Figure 5: Operation of the I/O Box

## 8.2 IO-Box Settings

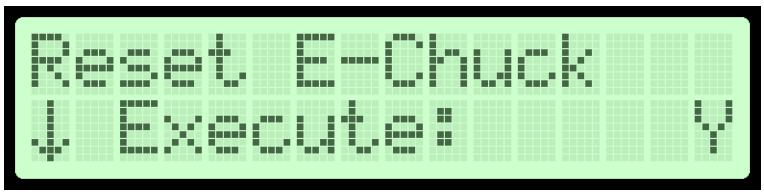
### 8.2.1 Home




- State (Ready, Error, etc.)
- Clamping torque (200mNm)
- Clamping direction
  - Outside: Outside clamping
  - Inside: Inside clamping
- *P1*: Cycles through the menu
- *P2:* Clamping
  - Force is specified via the analog input or the menu

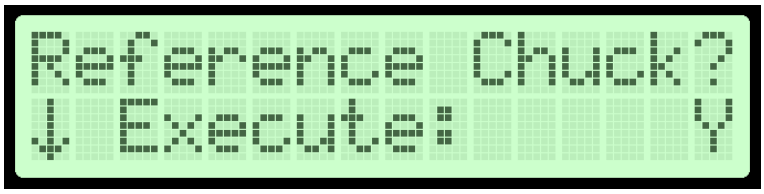
- *P3*: Release E-Chuck

### 8.2.2 Reset



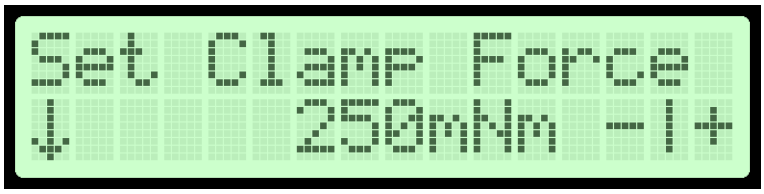

- *P1*: Cycles through the menu
- *P2:* No function
- *P3*: E-Chuck clears errors and resets

### 8.2.3 Reference



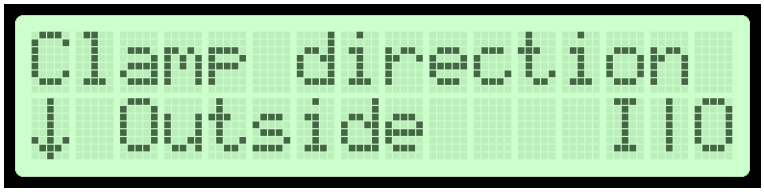

- *P1*: Cycles through the menu
- *P2*: No function
- *P3*: Start Homing

### 8.2.4 Torque



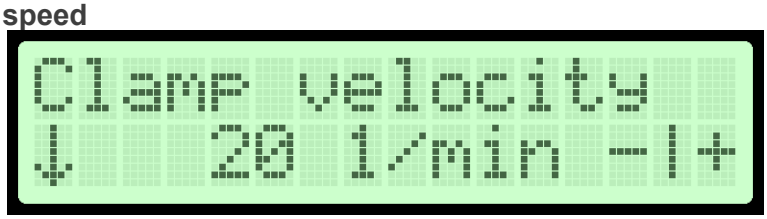

- *P1*: Cycles through the menu
- *P2:* Reduce torque by 50mNm
- *P3*: Increase torque by 50mNm

### 8.2.5 Direction



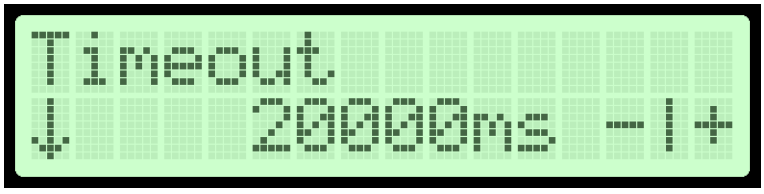

- *P1*: Cycles through the menu
- *P2:* Clamp inner diameter
- *P3*: Clamp outer diameter

### 8.2.6 Clamping speed



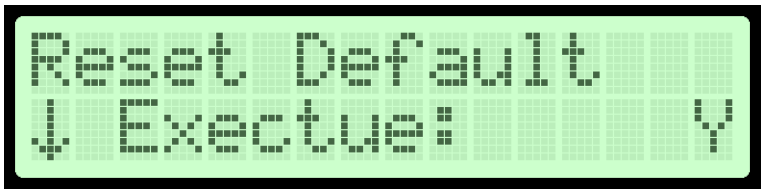

- *P1*: Cycles through the menu
- *P2:* Decreases speed by 1 RPM
- *P3*: Increases speed by 1 RPM

### 8.2.7 Timeout



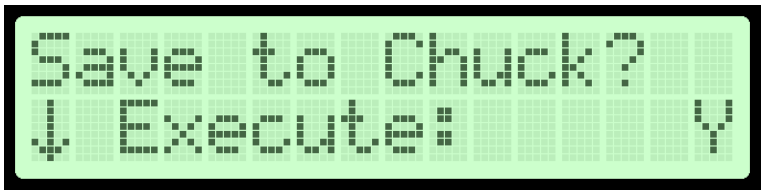

- *P1*: Cycles through the menu
- *P2:* Reduces timeout by 100ms
- *P3*: Increases the timeout by 100ms

### 8.2.8 Factory Reset




- *P1*: Cycles through the menu
- *P2:* No function
- *P3*: Resets all values to factory settings, but does not save them

### 8.2.9 Save

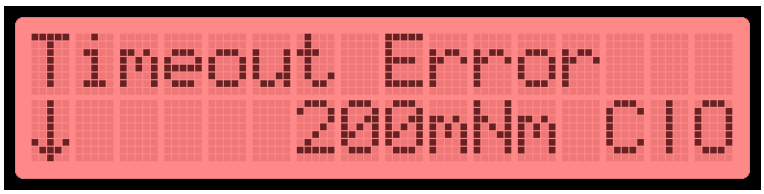



- *P1*: Cycles through the menu
- *P2:* No function
- *P3*: Stores the currently set values so that they remain persistent after a power loss

## 8.3 View E-Chuck Status

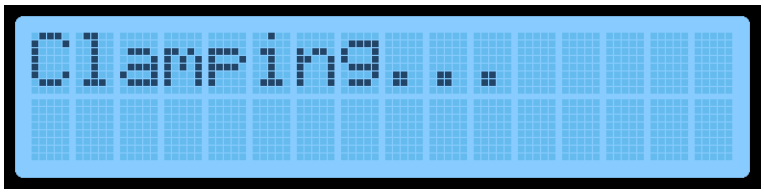
The state of the E-Chuck is automatically displayed if it does not correspond to the idle mode:

### 8.3.1 Errors



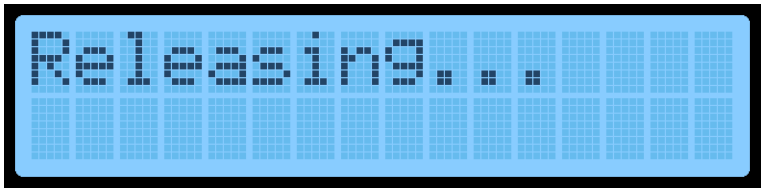

The same functionality is still available as with Menu 8.2.1

### 8.3.2 Clamping



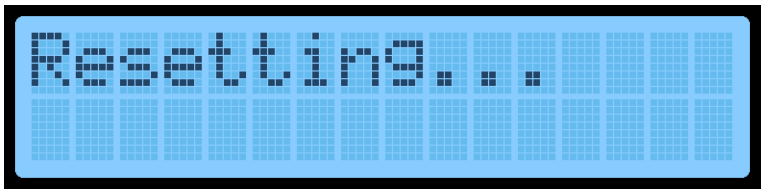

The E-Chuck is clamping

### 8.3.3 Solve



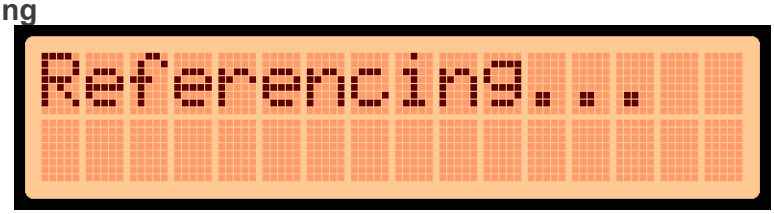

The E-Chuck is releasing

### 8.3.4 On reset



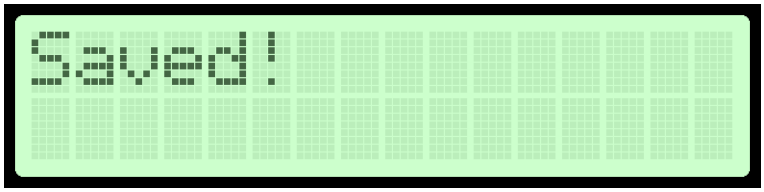

E-Chuck resets

### 8.3.5 Referencing




The E-Chuck is referencing

### 8.3.6 Saved




The values have been successfully saved

## 8.4 Automatic operation of the E-Chuck via I/O box

The E-Chuck can be controlled directly from the machine control via digital I/O.

The connections to your machine control can be found in chapter 6.3 or the E-scheme.

The required signals can be found in the timing chart.

Note on clamping direction:
The change of the clamping direction only reacts to the flank, a rising flank sets the clamping direction to clamp outer diameter, a falling flank sets the clamping direction to clamp inner diameter.

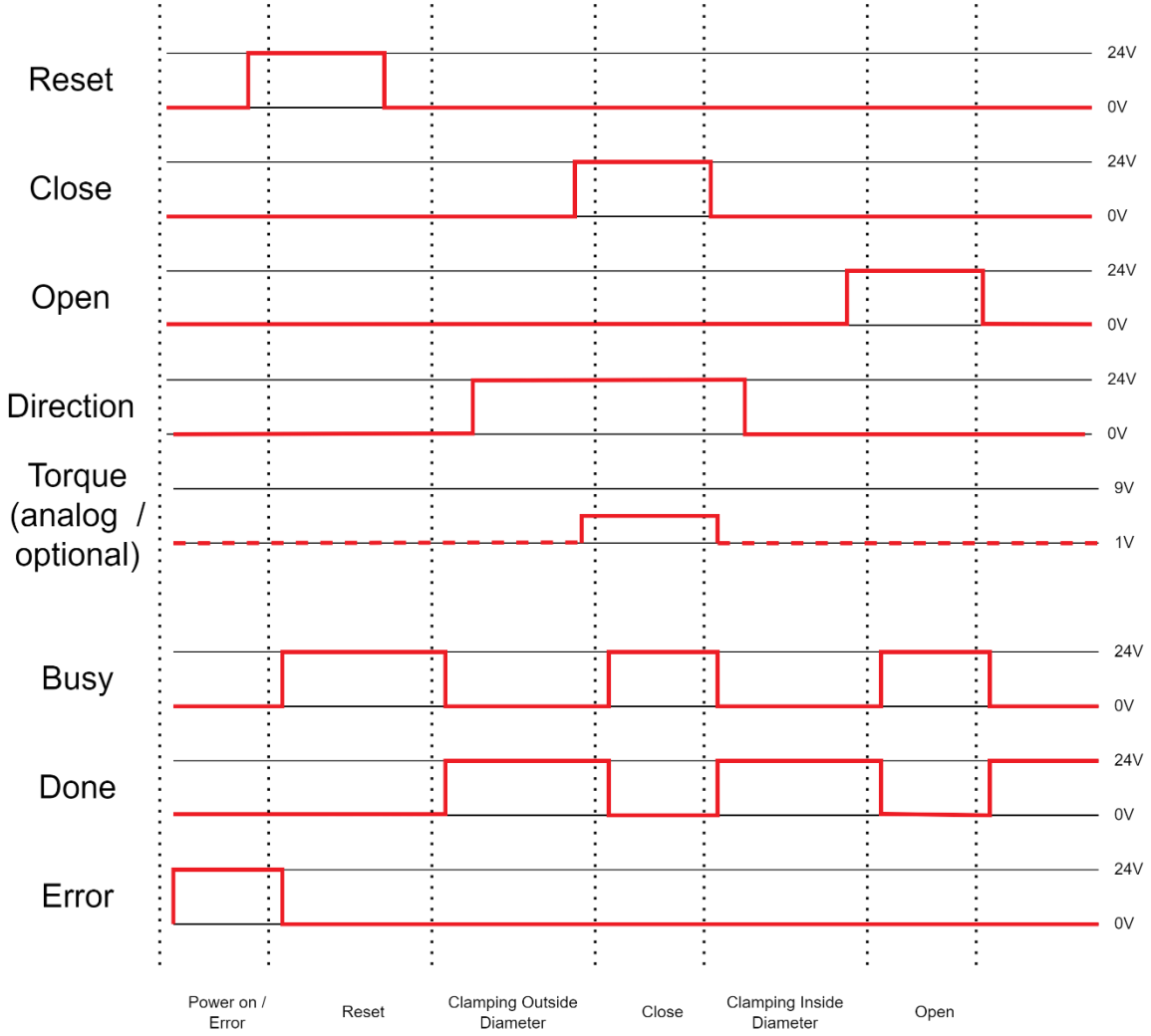



Figure 6: Timing chart

# 9 Troubleshooting

## 9.1 Error in standby state

| 9.1.1.1 Error pattern | 9.1.1.2 Cause | 9.1.1.3 Suggested solutions |
|---|---|---|
| LED ring does not light up | Missing power supply 24V Power | Check Power Supply (X3) |
| LED ring lights up red | Active error on the E-Chuck | Eliminate errors (E-Chuck should be able to rotate freely), perform reset |
| IO-Box: Can Comm Error | Lack of communication between IO-Box and E-Chuck | Check communication & power supply (X3) |
| Slip ring jammed | Temperature too cold | Let the E-Chuck run for 24 hours so that everything can heat up |

## 9.2 Clamping errors

| 9.2.1.1 Error pattern | 9.2.1.2 Cause | 9.2.1.3 Suggested solutions |
|---|---|---|
| E-Chuck Has Not Tensioned, Green LED Ring | The E-Chuck has reached the required force before the part has been clamped | Perform a reset, increase the clamping force if necessary |
| E-Chuck Has Not Tensioned, Red LED Ring | The E-Chuck could not start to | Solve by hand, perform reset Make sure the E-Chuck doesn't get stuck at the end of the stroke |
| IO Box: TimeOut Error | The E-Chuck could not complete the opening process, the specified distance could not be driven | Solve by hand, perform reset Check the stroke and opening distance |

## 9.3 Error opening

| 9.3.1.1 Error pattern | 9.3.1.2 Cause | 9.3.1.3 Suggested solutions |
|---|---|---|
| E-Chuck Has Not Opened, Red LED Ring | The E-Chuck was unable to complete the opening process | Solve by hand, perform reset |
| IO-Box: TimeOut Error | The E-Chuck could not perform the opening process, it was not possible to release it | Solve by hand, perform reset |
| IO-Box Position Error | The E-Chuck could not complete the opening process, the specified distance could not be driven | Solve by hand, perform reset Check the stroke and opening distance |

# 10 Maintenance

## 10.1 Introduction

All operating materials require careful, regular cleaning and maintenance. Pay special attention to these works. With correct maintenance, you extend the life of the machine, shorten downtime and thus increase productivity.

## 10.2 Maintenance plan

| 10.2.1.1 Period | 10.2.1.2 Assembly | 10.2.1.3 Activity |
|---|---|---|
| Weekly | Whole Machine | Cleaning |
| Weekly | Electricity | Checking the connectors |

## 10.3 Cleaning

It is recommended to clean the entire machine weekly. The machine must only be cleaned when it is switched off.

**Caution!**

Do not use compressed air for machine cleaning. Parts or dust could get into the machine's motion sequence and cause malfunctions.
Do not use solvents, they can attack plastic parts, cable insulation or paintwork.
.

## 10.4 Safety during repairs

If you need to carry out repairs or service on the machine, turn off the main switch whenever possible.

**WARNING!**
Always lock switched off main switches with a padlock when you are carrying out work on the system.

# 11 Dismantling the machine

**Important**
At the end of the machine's service life, it must be disposed of by a qualified specialist company. In exceptional cases and after consultation with Maprox AG, the machine can be returned. Operating materials (e.g. oil, etc.) must also be disposed of properly.

Preparations must be made to dismantle the machine. Follow the points in order.

- Empty product completely
- Turn off machines
- Disconnect electrical supply.
- Prepare machines for forwarding

# 12 Appendix

- *E-Schema*
- *Declaration of incorporation*