

Operating Manual

SERIES P40-000

Programmable 1 or 2 Axes Position Controller



- Position Controller for 1 or 2 Axes
- Manual, Single or Program operation
- LCD display with 7 menu languages
- 16 freely configurable inputs & outputs
- Optionally with 12 bit analog output
- Useful functions like referencing, tool offset and batch counter
- Simple and intuitive handling
- Integrated diagnosis mode
- Optional RS232 interface
- Quick panel mounting

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Document- No. 799000347

Document- Name P40-000-MA-E_39-20

Document- Revision Rev. 12

Issue Date 2020-09-23

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1 Contents

1	Contents	3
2	General, Safety, Transport and Storage	6
2.1	Information Operating Manual	6
2.2	Explanation of Symbols	6
2.3	Statement of Warranties	7
2.4	Demounting and Disposal	7
2.5	General Causes of Risk.....	7
2.6	Personal Protective Equipment.....	7
2.7	Conventional Use	8
2.8	Safety Instructions for Transport, Unpacking and Loading	8
2.9	Handling of Packaging Material	8
2.10	Inspection of Transport	8
2.11	Storage	8
3	Product Features	9
3.1	Essential P40 Features	9
3.2	Operating Modes	9
4	Technical Data	10
4.1	Identification	10
4.2	Dimensions.....	10
4.3	Technical Data Controller	11
5	Installation and First Start-Up.....	12
5.1	Operating Area	12
5.2	Mounting / Installing	12
5.3	Activation of the Device	12
6	Design und Function	13
6.1	Key Functions.....	13
6.2	Display Functions.....	14
7	Handling & Operating Modes	15
7.1	Operating Modes	15
7.2	Referencing an Axis	19
8	Menu Structure and Parameter Levels.....	21
9	Axis Menu.....	22
9.1	Parameter Axis: Distances.....	22
9.2	Parameter Axis: Times.....	27
9.3	Parameter Axis: Settings	29
9.4	Parameter Axis: Analog - optional	37

9.5	Parameter Axis: Measuring System - optional.....	41
10	System Menu.....	42
10.1	System: Setup.....	42
10.2	System: System-Times	45
10.3	System: I/O Configuration.....	46
10.4	System: Default Parameters	52
11	Password Menu.....	53
12	Contrast Menu.....	53
13	Diagnosis / Error Messages Menu.....	54
13.1	Diagnosis	54
13.2	Error Messages and Error Handling	54
14	Parameter Lists	55
14.1	Parameter Axis: Distances.....	55
14.2	Parameter Axis: Times.....	55
14.3	Parameter Axis: Analog - optional	56
14.1	Parameter Axis: Measuring System - optional.....	56
14.2	Parameter Axis: Settings	57
14.3	System: Setup.....	58
14.4	System: Times.....	58
15	I/O Configuration Notation Tables.....	59
16	Connections.....	61
16.1	Plug Arrangement	61
16.2	Pin Assignment	62
16.3	Connection Example Diagram	65
17	Disturbances, Maintenance, Cleaning.....	66
17.1	Fault Clearance.....	66
17.2	Re-start after Fault Clearance.....	66
17.3	Maintenance.....	67
17.4	Cleaning	67
18	Type Designation	68
19	Accessories.....	69
20	Index	71

Image Directory

Figure 1: P40-000 controller with panel housing	9
Figure 2: Dimensions of the P40 controller	10
Figure 3: Key Functions	13
Figure 4: Display Functions	14
Figure 5: Manual Operation	15
Figure 6: Single Operation	17
Figure 7: Program Operation	18
Figure 8: Correction stop with 2 speeds	23
Figure 9: Correction stop with 3 speeds	24
Figure 10: Assigning an analog output to an axis	39
Figure 11: Assigning an analog input to an axis	41
Figure 12: Analog Input Calibration	41
Figure 13: Input assignment	51
Figure 14: Output assignment	52
Figure 15: Plug arrangement	61
Figure 16: Connection example diagram	65

Table Directory

Table 1: Error Messages and Error Handling	54
Table 2: Axis parameter list: Distances	55
Table 3: Axis parameter list: Times	55
Table 4: List of analog parameters	56
Table 5: Calibration of analog Inputs	56
Table 6: List of general axis parameters	57
Table 7: List of system parameters: setup	58
Table 8: List of system parameters: times	58
Table 9: Notation table for input configurations	59
Table 10: Notation table for output configurations	60
Table 11: Measuring system connections	62
Table 12: Input connections	62
Table 13: Output connections	62
Table 14: Analog / PID output connections Table 15: Power supply connections	64
Table 16: Analog output / motor drive controller MCC	64
Table 17: Accessories	69

2 General, Safety, Transport and Storage

2.1 Information Operating Manual




This manual contains important information regarding the handling of the device. For your own safety and operational safety, please observe all safety warnings and instructions. Precondition for safe operation is the compliance with the specified safety and handling instructions. Moreover, the existing local accident prevention regulations and the general safety rules at the site of operation have to be observed.

Please read the operating manual carefully before starting to work with the device! It is part of the product and should be kept close to the device and accessible for the staff at any time. The illustrations in the manual are for better demonstration of the facts. They are not necessarily to scale and can slightly differ from the actual design.


2.2 Explanation of Symbols

Special notes in this manual are characterized by symbols. The notes are introduced by signal words which express the magnitude of danger. Please follow this advice and act carefully in order to avoid accidents, damage, and injuries.


Warning notes:

	DANGER! This symbol in connection with the signal word "Danger" indicates an immediate danger for the life and health of persons. Failure to heed these instructions can result in serious damage to health and even fatal injury.
	WARNING! This symbol in connection with the word „Warning“ means a possibly impending danger for the life and health of persons. Failure to heed these instructions can result in serious damage to health and even fatal injury.
	CAUTION! This symbol in connection with the signal word "Caution" indicates a possibly dangerous situation. Failure to heed these instructions can lead to minor injuries or damage of property.



Special safety instructions:

	DANGER! This symbol in connection with the signal word "Danger" indicates an immediate danger for the life and health of persons due to voltage. Failure to heed these instructions can result in serious damage to health and even fatal injury. The operations may only be carried out by a professional electrician.
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Tips and recommendations:

	NOTE! ...points out useful tips and recommendations as well as information for an efficient and trouble-free operation.
---	---

Reference marks:

-  Marks a reference to another chapter of this manual.
-  Marks a reference to another chapter of another document.

2.3 Statement of Warranties

The producer guarantees the functional capability of the process engineering and the selected parameters.

2.4 Demounting and Disposal

Unless acceptance and disposal of returned goods are agreed upon, demount the device considering the safety instructions of this manual and dispose it with respect to the environment.

Before demounting, disconnect the power supply and secure against re-start. Then disconnect the supply lines physically and discharge remaining energy. Remove operational supplies and other material.

Disposal:

Recycle the decomposed elements: Metal components in scrap metal, Electronic components in electronic scrap, Recycle plastic components, dispose the remaining components according to their material consistence



CAUTION!

Wrong disposal causes environmental damages!
Electronic scrap, electronic components, lubricants and other auxiliary materials are subject to special refuse and can only be disposed by authorized specialists!

Local authorities and waste management facilities provide information about environmentally sound disposal.

Safety



CAUTION!

Please read the operating manual carefully, before using the device! Observe the installation instructions!
Only start up the device if you have understood the operating manual.
The operating company is obliged to take appropriate safety measure.
The initial operation may only be performed by qualified and trained staff.
Selection and installation of the devices as well as their embedding into the controlling system require qualified knowledge of the applicable laws and normative requirements on the part of the machine manufacturer.

2.5 General Causes of Risk

This chapter gives an overview of all important safety aspects to guarantee an optimal protection of employees and a safe and trouble-free operation. Non-observance of the instructions mentioned in this operating manual can result in hazardous situations.

2.6 Personal Protective Equipment

Employees have to wear protective clothing during the installation of the device to minimize danger of health.

Therefore: Change into protective clothing before performing the works and wear them throughout the process. Additionally observe the labels regarding protective clothing in the operating area.

Protective clothing:

	<p>PROTECTIVE CLOTHING ... is close-fitting working clothing with light tear strength, tight sleeves and without distant parts. It serves preliminarily for protection against being gripped by flexible machine parts. Do not wear rings, necklaces or other jewelry.</p>
	<p>PROTECTIVE GLOVES ...for protecting the hands against abrasion, wear and other injury of the skin.</p>
	<p>PROTECTIVE HELMET ...for protection against injuries of the head.</p>

2.7 Conventional Use

The product described in this manual was developed to execute safety-related functions as a part of an entire assembly or machine. The ELGO position controller P40-000 only serves for positioning applications.

**CAUTION!**

Danger through non-conventional use!

Non-intended use and non-observance of this operating manual can lead to dangerous situations.

Therefore:

- Only use the device as described
- Strictly follow the instructions of this manual

Avoid in particular:

- Remodeling, refitting or changing of the construction or single components with the intention to alter the functionality or scope of the device.

Claims resulting from damages due to non-conventional use are not possible. Only the operator is liable for damages caused by non-conventional use.

2.8 Safety Instructions for Transport, Unpacking and Loading

**CAUTION!**

Transport the package (box, palette etc.) professionally. Do not throw, hit or fold it.

2.9 Handling of Packaging Material

Notes for proper disposal: §2.4

2.10 Inspection of Transport

Check the delivery immediately after the receipt for completeness and transport damage.

In case of externally recognizable transport damages:

- Do not accept the delivery or only accept under reserve.
- Note the extent of damages on the transportation documents or delivery note.
- File complaint immediately.

**NOTE!**

Claim any damage immediately after recognizing it.

The claims for damage must be filed in the lawful reclaim periods.

2.11 Storage

Store the device only under the following conditions:

- Do not store outside
- Keep dry and dust-free
- Do not expose to aggressive media
- Protect from direct sun light
- Avoid mechanical shocks
- Storage temperature (§4) needs to be observed
- Relative humidity (§4) must not be exceeded
- Inspect packages regularly if stored for an extensive period of time (>3 months)

3 Product Features

The position controller of the P40 series is used for simple positioning applications, e. g. with wood or sheet metal processing machines. The main advantage of this controller is the simple, easy and fast entry of required positions and quantities. The actual value, target value and quantity are displayed by a well legible LCD display in the control panel. After entering a target position value and a quantity, the positioning process can be started.

The P40 has an internal program memory for a maximum of 1,000 blocks. For the positioning procedure, three different versions of output signals are available:

1. Switch-off positioning with up to 3 speeds via digital outputs.
The assignment and logic (active HIGH/LOW) can be parametrized.
2. Optionally (☞ 18) via unregulated 12 bit analog output (± 10 V).
3. Optionally (☞ 18) via regulated 12 bit PID analog output (± 10 V).

The P40 controller is with 24 VDC (+10 / -20 %).

For an alternative supply with AC-voltage, an external power pack is available (☞ 19)

3.1 Essential P40 Features

- Available as Single or Dual Axis-Controller
- Analog output or digital outputs for 1 - 3 speed operation
- 16 free programmable digital in- & outputs
(8 instead of 16 digital I/Os optionally, see ☞ 18)
- Program memory with up to 1000 program blocks



Figure 1: P40-000 controller with panel housing

3.2 Operating Modes

The P40 consists of three general operation modes:

- | | |
|-----------------|---|
| Manual: | Inching operation moves the individual axes manually by operating the keypad. |
| Single: | A whole set can be processed. |
| Program: | In the program mode, data sets can be strung together or programmed.
This program blocks are then processed sequentially. The program consists of several different data sets. |

4 Technical Data

4.1 Identification

The type label serves for the identification of the unit. It is located on the housing of the sensor and gives the exact type designation (☞ 18) with the corresponding part number. Furthermore, the type label contains a unique, traceable device number. When corresponding with ELGO please always indicate this data.

4.2 Dimensions

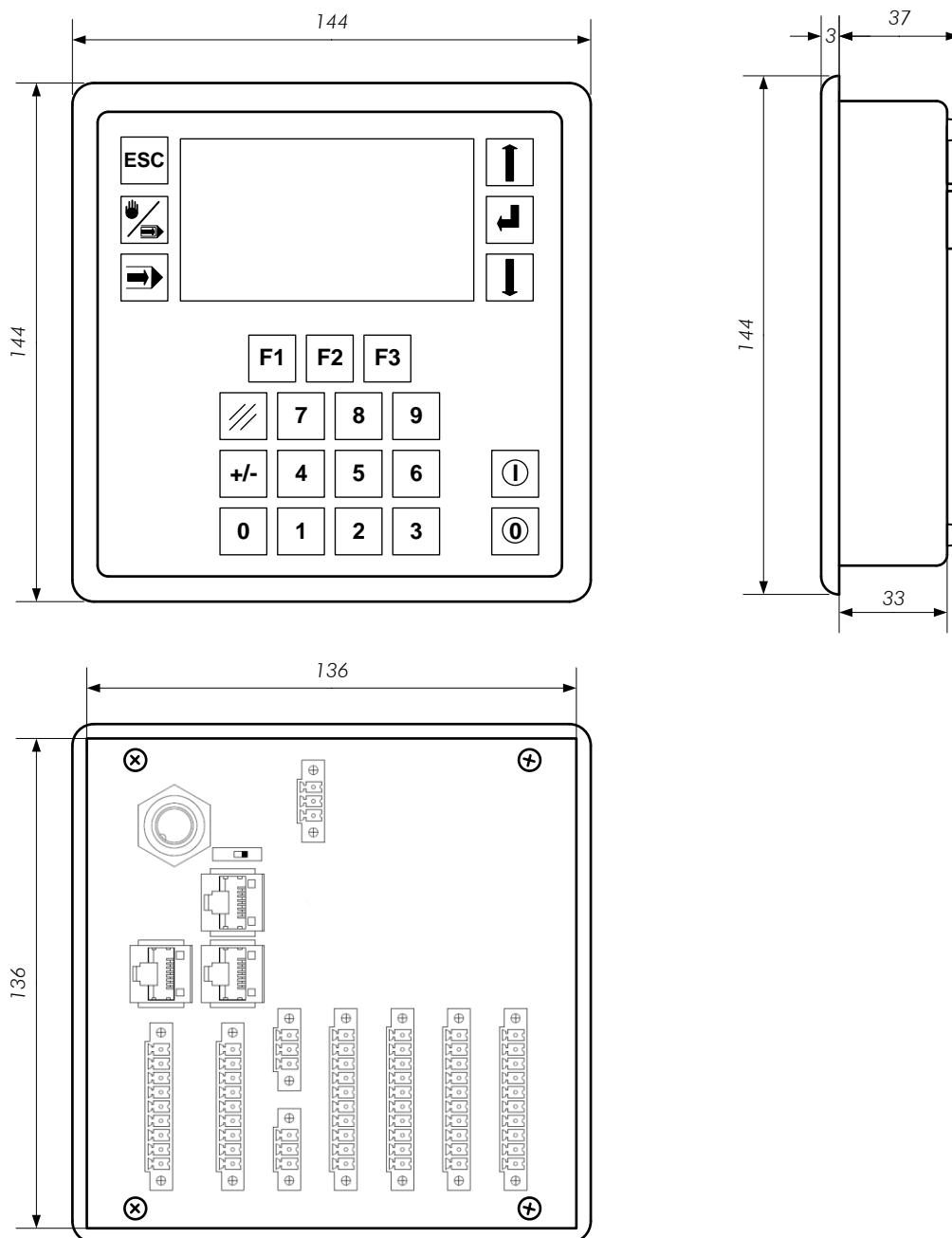


Figure 2: Dimensions of the P40 controller

4.3 Technical Data Controller

Technical Data P40-000 (standard version)

Mechanical Data

Housing	panel housing
Housing material	front plate: aluminium, housing: galvanized steel sheet
Front plate dimensions	W x H = 144 x 144 mm
Panel cutout	W x H = 138 x 138 mm
Keyboard	membrane keyboard
Installation depth	37 mm (without connectors) 75 mm (with connectors)


Electrical Data

Display	LCD dot matrix 120 x 80 pixels with white background lighting
Hardware	32 bit microcontroller with 1 MByte Flash and 56 KByte RAM
Program memory	up to 1.000 blocks (more on request)
System accuracy	± 1 increment
Power supply voltage	24 VDC +10 / -20 %
Current consumption	24 VDC: max. 150 mA (unloaded); permitted tot. current incl. self-consumption: 1 A
Encoder supply voltage	24 VDC or 5 VDC (order designation ☞ 18)
Encoder load	max. 130 mA
Input signals (encoder)	HTL, TTL, analog (order designation ☞ 18)
Incremental input channels	A, B, Z resp. A, A', B, B', Z, Z'
External inputs	16 x digital PNP inputs with free programmable assignment and switching logic (active HIGH/LOW)
Input current / pin	max. 10 mA
Pulse time for inputs	min. 300 ms
Input frequency	max. 100 kHz (higher on request)
Analog inputs (option)	1 ... 2 analog inputs (12 bit) at 3.3 V sensor supply (☞ 18)
Output signals	16 digital PNP outputs with freely programmable assignment and logic (active HIGH / LOW)
Output current	max. 150 mA per output / 500 mA total current across all outputs; the outputs are durable short circuit proof (no multiple short circuits)
Freewheel clutch / outputs	for inductive loads integrated (clamping voltage at the output max. -45 V)
Analog outputs (option)	optional: ± 10 V PID or ± 10 V unregulated (each 12 bit) (☞ 18)
Interfaces (option)	RS232 (☞ 18)
Connections	industry standard plug-in terminals (3.81 mm grid, lockable) and additional RJ45 sockets (depending on version)
Power down memory	E ² Prom (service life: 1.000.000 switching on/off cycles or 40 years)
Further options	8 = 8 instead of 16 digital inputs and outputs C = screw terminals instead of plug-in terminals


Environmental Conditions



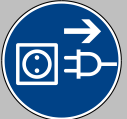

Operating temperature	0 ... +45° C
Storage temperature	-20 ... +50° C
Humidity	max. 80 %, non-condensing
Protection class (front)	IP43 (installed state)
Protection class (rear)	IP00

5 Installation and First Start-Up

	<p>CAUTION Please read the operating manual carefully before using the device! Strictly observe the Installation instructions! In case of damage caused by failure to observe this operating manual, the warranty expires.</p> <p>ELGO is not liable for any secondary damage and for damage to persons, property or assets.</p> <p>The operator is obliged to take appropriate safety measures.</p> <p>The first start-up may only be performed by qualified staff that has been trained and authorized by the operator.</p>
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5.1 Operating Area

	<p>WARNING! Do not use the device in explosive or corrosive environments! The device must not be installed close to sources of strong inductive or capacitive interference or strong electrostatic fields!</p>
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	<p>CAUTION! The electrical connections must be made by suitably qualified personnel in accordance with local regulations.</p>
	<p>The device may be designed for switchboard mounting. During work on the switchboard, all components must be de-energized if there is a danger of touching the energized parts! (protection against contacts)</p> <p>Wiring works may only be performed in the de-energized state!</p>
	<p>Thin cable strands have to be equipped with end sleeves!</p> <p>Before switching on the device, connections and plug connectors have to be checked!</p>
	<p>The device must be mounted in a way that it is protected against harmful environmental influences such as splashing water, solvents, vibration, shock and severe pollution and the operating temperature must not be exceeded.</p>

5.2 Mounting / Installing

For the installation of the device, a panel section must be cut into the respective control panel. The cutout dimensions must correspond to the measurements defined in the technical data (☞ 0).

The device is fastened into the panel cutout by using two studs with swiveling flaps which are already attached to the housing. For installation, only a screwdriver is necessary.

5.3 Activation of the Device

After connecting the power supply voltage, the device is switched on and ready for operation.

6 Design und Function

6.1 Key Functions

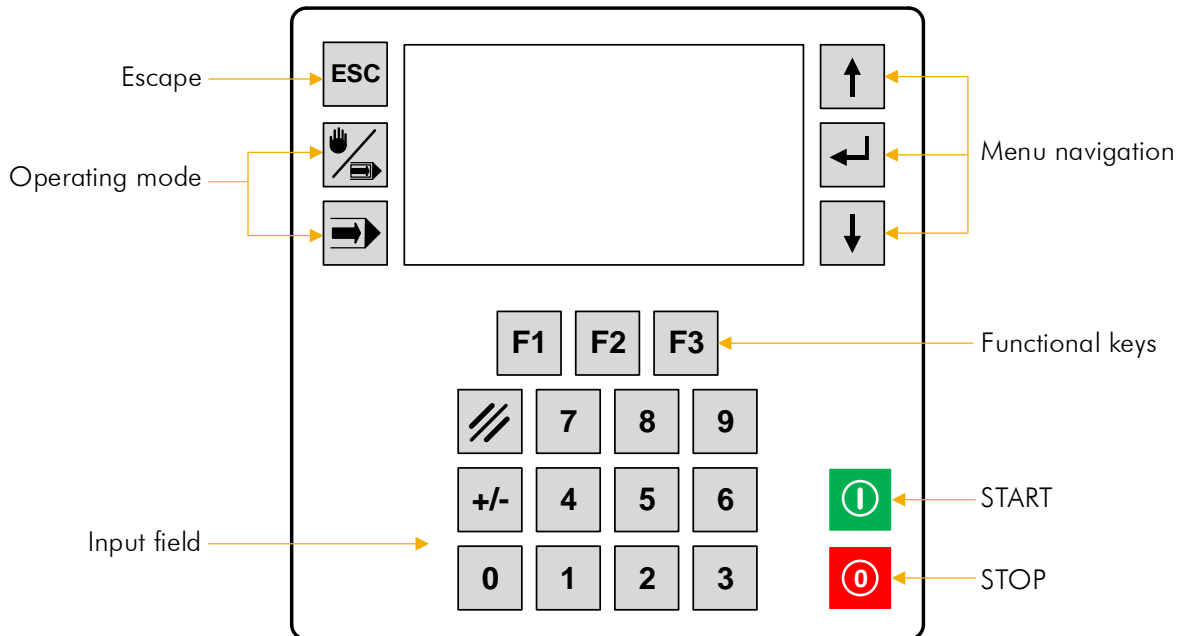













Figure 3: Key Functions

	Switchover between "Manual" and "Single" mode
	Operation mode "Program" (only if program mode is activated)
	To enter the parameter level (press for 3 seconds) and to exit the parameter level or a submenu (press shortly)
	Select or confirm (ENTER button)
	Cursor navigation „down“
	Cursor navigation „up“
	Functional keys (depending on menu level and operating mode)
	Delete or reset an entry
	Sign switchover
	Enter a target position or a parameter value
	Start positioning



Stop positioning

6.2 Display Functions

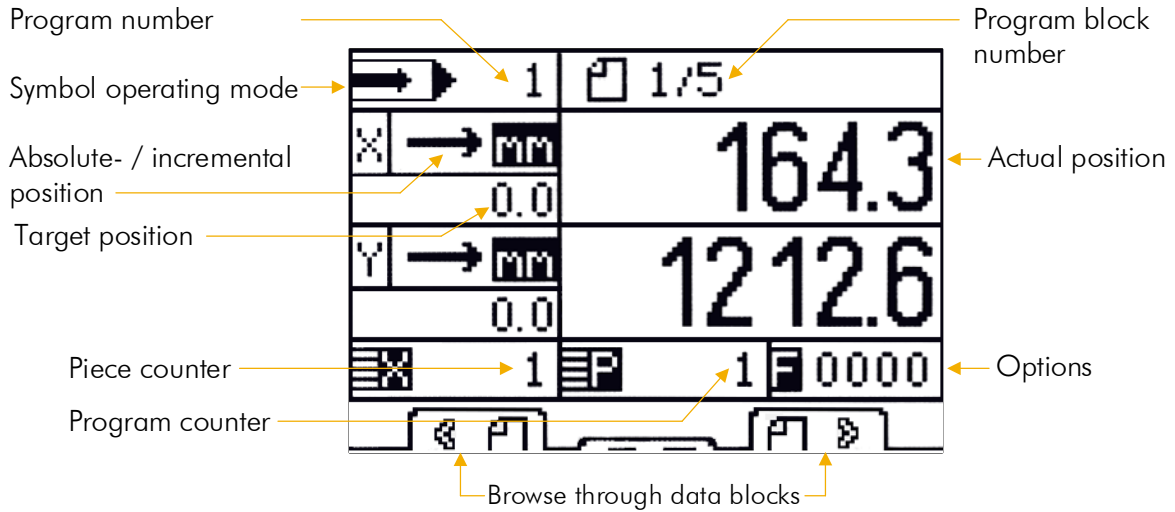


Figure 4: Display Functions



NOTE! The display elements can vary depending on operating mode and configuration.

7 Handling & Operating Modes

7.1 Operating Modes

Depending on the parameter setting, the screen display and assignment of the function keys can vary.

7.1.1 Manual Operation

In this mode the axes can be moved manually (manual inching). To do this, select the corresponding axis with the cursor and change the position by using the functional keys F1 / F3.

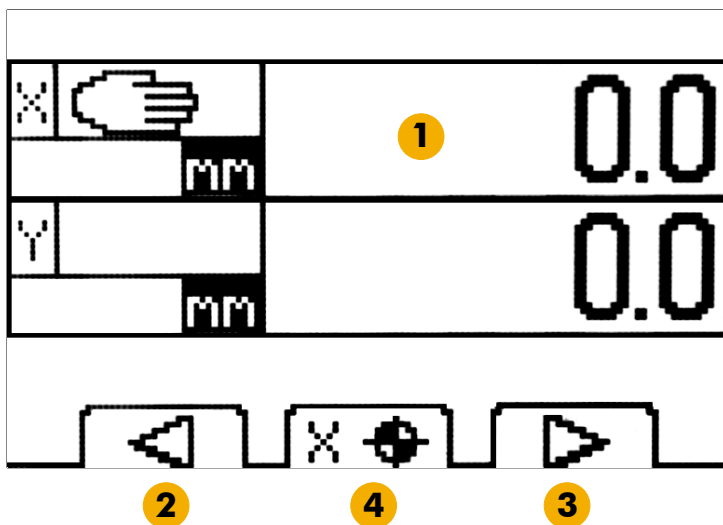


Figure 5: Manual Operation

- 1** Displays the actual position of the respective axis
- 2** **F1** Moves the axis in negative direction
- 3** **F3** Moves the axis in positive direction
- 4** **F2** Referencing of the respective axis: Use the cursor to select the desired axis and press the **F2** button longer than 2 seconds.



Note!

The parameter axis → times (☞ 9.2) → “manual change” can be used to define a time. In case of manual operation, there is a change from creep speed to fast speed after the expiration of the time adjusted here.

See also table in section ☞ 14.2 parameter axis → times → “manual change”

Referencing:

see chapters: ☞ 7.2 “Referencing an Axis”, ☞ 9.3 “Parameter Axis: ” and table in section ☞ 14.1 “Parameter Axis: Distances”

7.1.2 Single Operation

This mode allows moving all active axes simultaneously after entering the desired target values and confirmation by the **START** key.

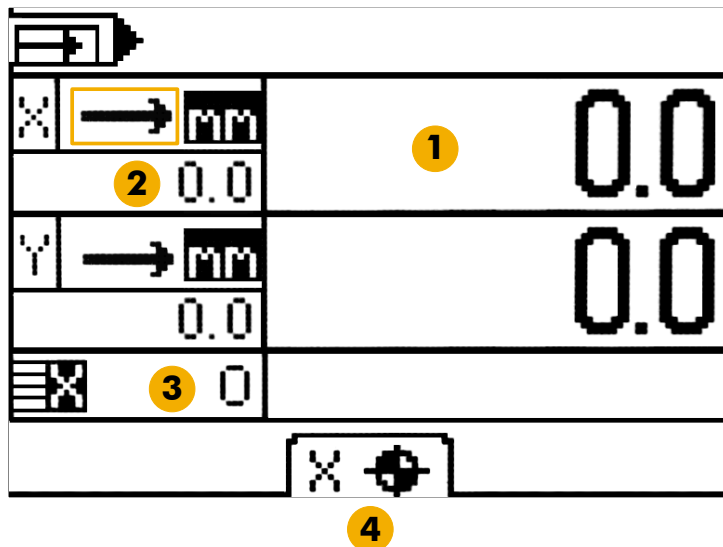



Figure 6: Single Operation

- 1** Displays the actual position of the respective axis
- 2** **F1** Displays the target value of the respective axis
 - Incremental positioning:
 - ▀ → target value is an absolute position
 - ▀ → target value is an incremental position +
 - ← → target value is an incremental position -
- 3** **F3** Input field for quantity
- 4** **F2** Referencing of the respective axis: Use the cursor to select the desired axis and press the **F2** button longer than 2 seconds.

	<p>NOTE!</p> <p>Incremental Positioning: Select corresponding axis with the cursor and change positioning mode by pressing the E ENTER nter-Key (see chapter 9.3 "Parameter Axis: ")</p> <p>Referencing: see chapters: 7.2 "Referencing an Axis", 9.3 "Parameter Axis: " and table in section 14.1 "Parameter Axis: Distances"</p>
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7.1.3 Program Operation

When using the program mode, the user has the possibility to summarize several program blocks into one program. Depending on the configuration, different program sequences are possible.

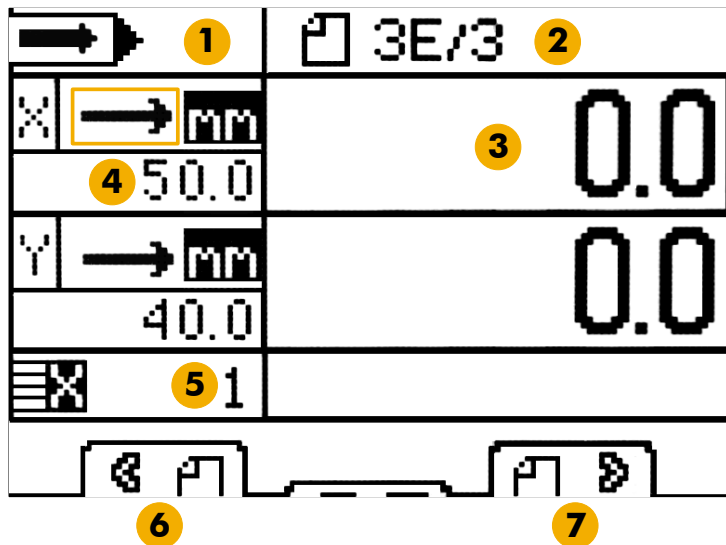









Figure 7: Program Operation

- 1**  Enter and confirm a program number
-  Incremental positioning:

 -  target value is an absolute position
 -  target value is an incremental position +
 -  target value is an incremental position -
- 2** Shows the actual program block and the program end (example: 3E = 3 last program block)
- 3** Displays the actual position of the respective axis
- 4** Displays the target value of the respective axis
- 5** Input field for quantity
- 6**  Previous program block
- 7**  Next program block

7.1.3.1 Create a Program

Press the program key to activate the program mode. Before a program can be created, a program number must be assigned and confirmed with the **ENTER** key. The corresponding data sets (blocks) then will be assigned to the defined program number. In order to navigate through the various program blocks, the keys **F1** and **F3**


are used. It is also possible to select a program block directly, by entering the block number in the corresponding input field and confirming with **ENTER**.

After entering the required data sets, the program end has to be marked. For this, the **F2** key must be pressed during the cursor is in the input field for the block number. The defined program end will then be marked with the letter "E" behind the block number.

7.1.3.2 Processing a Program

The program mode can be selected directly by using the **PROGRAM** key. First, choose a program by entering a program number and confirm it by using the **ENTER** key. The keys **F1** and **F3** can be used to scroll through all the program blocks. The positioning will start automatically when the **START** key is pressed. Now, all data sets will be processed in dependency of parameter settings until the end marker of the program is reached.

The positioning process can be interrupted by pressing the **STOP** key at any time. In this case, the program remains in the current block. To continue the program, press the **START** key again.

	<p>NOTE!</p> <p>The end of program is necessarily needed for the automatic run. In case of missing end of program a warning is displayed.</p> <p>Incremental Positioning: Select corresponding axis with the cursor and change positioning mode by pressing the ENTER key.</p> <p>☞ 9.3 "Parameter Axis: "</p>
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7.2 Referencing an Axis

The axes can be referenced in the manual mode and single mode. Depending on the setting in **parameter axis → X-/Y-axis → settings → reference mode** the following applies:

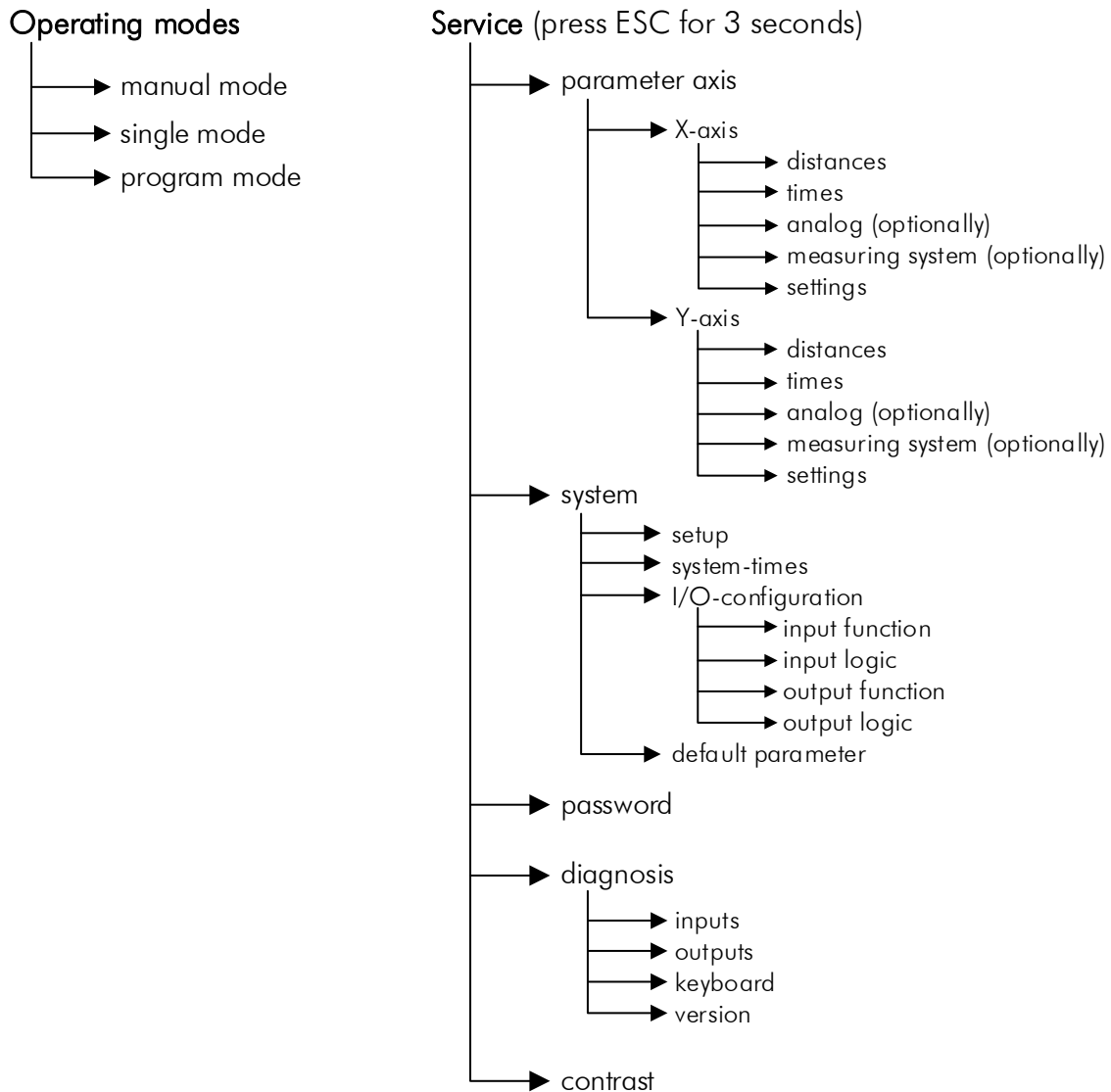
- **Mode 1, 3, 5, 7:** The **F2** key must be pressed for minimum 2 seconds.
With a dual-axis controller, the reference symbol of the corresponding axis has to be displayed
 - in the manual mode the corresponding axis needs to be selected,
 - in the single mode the target value of the corresponding axis needs to be selected.
- **Mode 2, 4, 6, 8:** for referencing, an external input must be activated
- **Mode 1** or **2:** the value deposited in **parameter axis → X-/Y-axis → distances → referenceval.** will be taken as the current actual value for the respective axis
- **Mode 3** or **4:** the value entered for target position will be taken as current actual value
- **Mode 5** or **6:** referencing to the positive switch end-position with index pulse (see next section)
- **Mode 7** or **8:** referencing to the negative switch end-position with index pulse (see next section)

7.2.1 Functionality of Referencing

The controller moves the axis that needs to be referenced in dependence of the parameter setting in **parameter axis → X-/Y-axis → settings → reference mode**. The output "reference drive run" is set. If the corresponding input (switch end-position positive or negative) is activated, the controller will stop. After a dwell time the controller moves in the opposite direction.

As soon the appropriate input (switch end-position) is disabled, the index pulse will be released. With the next zero pulse, the controller stops and the reference value stored in **parameter axis → X-/Y-axis → distances → referenceval.** will be transferred into the actual value window.

8 Menu Structure and Parameter Levels



NOTE!

The service mode with the parameter levels can be accessed by keeping the **ESC** key pressed for minimum 3 seconds. Most of the parameters - if not marked otherwise - can only be changed after entering the password resp. PIN code.

PIN CODE: **250565**

9 Axis Menu

9.1 Parameter Axis: Distances

This menu is used to set relevant distances for the X- and Y-axis separately.

Distances

Access to parameters concerning distances e.g. speeds etc.

Times

Access to parameters concerning times e.g. position reached, zero speed monitoring, rotary encoder etc.

Settings

Access to the general axis parameters

- Slow forward
- Creep forward
- Correction stop forward
- Slow backward
- Creep backward
- Correction stop backward
- Tolerance window
- Manipulation
- Spindle compensation
- Forced loop
- Reference value
- Retract length
- End position Min
- End position Max
- Factor
- Displacement
- Tool correction
- Fix position

A detailed description of these parameters can be found on the next pages...

Slow forward / slow backward = middle speed

This parameter defines the distance at which the controller switches from high speed to slow speed before reaching the target position.

Creep forward / creep backward = slow speed

This parameter defines the distance at which the controller switches from slow speed to creep speed before reaching the target position.

Correction stop forward / correction stop backward

This parameter can be used to compensate a constant overrun.

Example: If the target position is overrun by 0.2 mm constantly, the parameter must be set to 0.2 mm. The stop command is then moved forward by 0.2 mm.

At first start-up the initial setting of the stop offset is "0" in order to be able to calibrate the overrun accurately. For an exact positioning the stop offset should be as small as possible (0.0 to 0.2 mm) i.e. the mechanical friction should be steady over the entire run distance and the slow speed and/or creep speed must be adjusted accordingly small.



NOTE!

When positioning with PID, the correction stop serves as tolerance window.

Example: Positioning with 2 speeds

For the parameter setting generally applies:

$$\text{Slow speed} = \text{Creep speed} > \text{Correction stop}$$

Slow speed: 10.0 mm
 Creep speed: 10.0 mm
 Correction stop: 1.0 mm

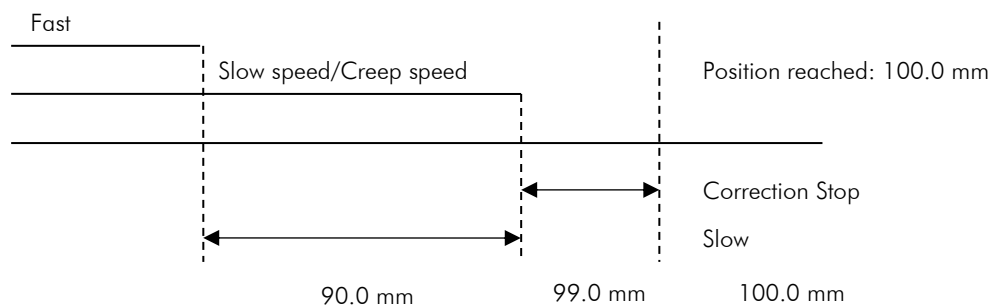


Figure 8: Correction stop with 2 speeds

Example: Positioning with 3 speeds

For the parameter setting generally applies:

Slow speed > Creep speed > Correction stop

Slow speed: 20.0 mm
 Creep speed: 10.0 mm
 Correction stop: 1.0 mm

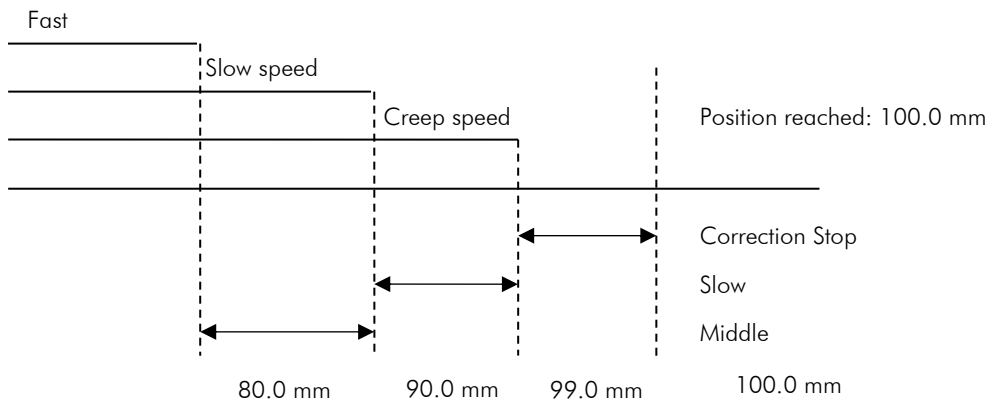


Figure 9: Correction stop with 3 speeds

Tolerance window

If the current actual position of the target position corresponds +/- to the value of "tolerance window", the corresponding output "tolerance zone" (☞ 10.3.2) is set.

Manipulation

It is possible to adjust the indicator of the actual value of the corresponding axis to the target value within the entered tolerance window. The entered tolerance range is always active in the + and - range around the target value. The real actual value is saved in the microprocessor, i.e. no positioning errors will add up.

Example: Entered Value = 0.2 mm (i.e. Tolerance Window ± 0.2 mm)

Internal actual value	99.8 mm
Displayed actual value	100.0 mm
Target Value	100.0 mm

i

NOTE!

Before starting-up initially the tolerance window should be set to 0.

Spindle compensation

In order to adjust spindle or sprocket tolerances, the target position must always be approached from the same direction, i.e. in one direction the target position will be overrun by the entered value. After

expiration of the time entered in **parameter axis → X-/Y-axis → times → spindle compens.**, the axis will move to the defined target position again.

Forced loop

If the actual value is during an absolute positioning within the range target value +/– value of forced loop window, a forced loop is moved.

Reference value

This parameter is used to define reference value resp. reference position.

Retract length

When activating the external retract input, the axis moves depending on the retract mode setting (see 9.5 **parameter axis → X-/Y-axis → settings → retract mode**) around this value or to this value.

Software-end position minimum / maximum

These two values can be used if no mechanical switch end-positions are available or additionally to already existing mechanical switch end-positions.

End position min: This value should be set between the smallest length/position to be processed and zero (resp. shortly before the mechanical switch end-position).

End position max: This value should be set between the largest length/position to be processed and the maximum length (resp. shortly before the mechanical switch end-position).

Factor

The factor for analysis of the pulses is set here.

$$\text{Factor} = \frac{\text{distance resp. angle}}{\text{amount of clock pulse edges A and B}}$$



NOTE!

From software version 1.64 on, the decimal point (number of positions after decimal point) is calculated automatically. Basically, the controller triggers all four edges!

Displacement (no PIN necessary)

Here, positive or negative dimensions are programmed. The entered dimension is added to the actual position when activating an allocated input.

Tool correction (no PIN necessary)

In the incremental measurement mode this correction value is automatically added to the target value, i.e. the positioning process continues the movement by this value.

Fix Position

This register is used to determine a fixed position for each axis. When activating input "fixed position X" or "fixed position Y", the controller moves to this defined position.

9.2 Parameter Axis: Times

This menu is used to set relevant time parameters for the X- and Y-axis separately.

Distances

Access to parameters concerning distances e.g. speeds etc.

Times

Access to parameters concerning times e.g. position reached, zero speed monitoring, rotary encoder etc.

Settings

Access to the general axis parameters

- Position reached
- Spindle compensation
- Manual change
- Monitoring
- Delay Control enable
- Start delay
- Shutdown control
- Retract time
- Delay retract
- Reference time
- Quantity reached

A detailed description of these parameters can be found on the next pages...

Position reached

The output signal is statically if this time parameter is set to 0 or wiping if a time is defined here. The output will be active as soon the according axis has reached the target position.

Spindle compensation

In the peak of the loop drive the drive signals switch off. The controller returns to the target value when the parameterized time has expired (adjustment range 0.0 ... 99.9 s). With a setting of "0" there is no waiting period at the peak.

Manual change

After expiration of this time, the manual mode switches from the low speed to the next higher speed.

Monitoring

Defines a time within a range of 0.0 ... 99.9 s to monitor the encoder resp. measuring system. If there are no encoder signals during the programmed period of time, the drive signals are switched off to stop the engine. With a setting of "0" the monitoring is deactivated.

Delay control enable

After the **START** command the output "control enable" is activated. After reaching the target position and only after the expiration of the programmed time (range 0.0 ... 99.9 s) in the parameter **delay contr.enable** the output is set back. With a setting of "0", the output for the control enable is adjusted statically and remains active until the operation modes changes resp. until **STOP** key is pressed.

Start delay

At a **START** command the start of the positioning is delayed for the entered time.

Shutdown control

Here the time for shutdown after the position is reached is entered (range 0.0 ... 99.9 s).

Retract time

The dwell-time at the peak is entered here (range 0.0 ... 99.9 s). After this time has been expired, the position control is set back from the retract peak to the target value. In addition this value is also used for a retraction on time.

Delay retract

The retraction is delayed for the entered time.

Reference time

In the peak of the reference run the drive signals switch off. The controller will continue positioning after this time has been expired (range 0.1 ... 99.9 s).

Quantity reached

This parameter is used to set a time for the signal "quantity reached" (range 0.1 ... 99.9 s). With a setting of "0" the output "quantity reached" is statically set.

9.3 Parameter Axis: Settings

This menu is used to set general parameters for the X- and Y-axis separately.

Distances

Access to parameters concerning distances e.g. speeds etc.

Times

Access to parameters concerning times e.g. position reached, zero speed monitoring, rotary encoder etc.

Settings

Access to the general axis parameters

- Axis type
- Button manual mode
- Drive signal configuration
- Reference mode
- Spindle compensation mode
- Software end-position
- Hardware end-position
- Retract mode
- Error compensation
- Piece counter
- Incremental positioning
- Decimal point
- Display option manual
- Unit

A detailed description of these parameters can be found on the next pages...

Axis type

This parameter is used to define the type of axis (for each axis separately).

- IN: „Encoder“ → for usage with incremental encoder resp. measuring systems
- IN: „Analog“ → for usage with analog measuring systems resp. sensors
- OUT: „Digital“ → for positioning via digital drive signals
- OUT: „Analog+Dig“ → for positioning via unregulated analog output
- OUT: „PID+Digital“ → for positioning via regulated PID analog output

Button manual mode

The function of the keys in manual mode is defined in this parameter.

- off The P40 controller buttons **F1**, **F3** are deactivated for the corresponding axis (the respective axis can only be moved by the correspondingly assigned inputs)
- normal
- inverted

Drive signal configuration

With configuration of the drive signals different starting combinations for the corresponding speeds can be adjusted.

- Drive signals → Mode 1

3 speeds

Speed = output signals 1-3 ascending

Output 4 sets direction backward

Output signals	1	2	3	4
Creep forward	X			
Slow forward	X	X		
Fast forward	X	X	X	
Creep backward	X			X
Slow backward	X	X		X
Fast backward	X	X	X	X

- Drive signals → Mode 2

2 speeds (ELGO Standard)

Independent outputs for forward and backward

Independent outputs for fast and slow

Output signals	1	2	3	4
Creep forward	X	X		
Slow forward				
Fast forward	X		X	
Creep backward		X		X
Slow backward				
Fast backward			X	X

Signal configuration:

Forward: Drive signal 1
 Creep speed: Drive signal 2
 Fast speed: Drive signal 3
 Backward: Drive signal 4

- Drive signals → Mode 3

2 speeds

Speed = output signals 2 + 3

Output 4 set direction backward

Output signals	1	2	3	4
Creep forward	X	X		
Slow forward				
Fast forward	X		X	
Creep backward	X	X		X
Slow backward				
Fast backward	X		X	X

- Drive signals = Mode 4

2 speeds

Independent outputs for direction and speed

Output signals	1	2	3	4
Creep forward	X			
Slow forward				
Fast forward		X		
Creep backward			X	
Slow backward				
Fast backward				X

Signal configuration:

Forwards: Drive signal 1

Forwards fast: Drive signal 2

Backwards: Drive signal 3

Backwards fast: Drive signal 4

- Drive signals = Mode 5

3 speeds

Speed forward = output signals 1-3 ascending

Speed backward = always fast

Output 4 sets direction backward

Output signals	1	2	3	4
Creep forward	X			
Slow forward	X	X		
Fast forward	X	X	X	
Creep backward	X	X	X	X
Slow backward	X	X	X	X
Fast backward	X	X	X	X

- Drive signals = Mode 6

3 speeds

Binary coded

Output 1 = forward

Output 4 = backward

Outputs 2+3 = speed

Output signals	1	2	3	4
Creep forward	X	X		
Slow forward	X		X	
Fast forward	X	X	X	
Creep backward		X		X
Slow backward			X	X
Fast backward		X	X	X

- Drive signals = Mode 7

3 speed

Forward/backward separately

Output signals	1	2	3	4
Creep forward	X			
Slow forward	X	X		
Fast forward	X	X	X	
Creep backward				X
Slow backward		X		X
Fast backward		X	X	X

Reference mode

Available modes:

- Mode 1 Reference via parameter with **F2** button *
- Mode 2 Reference via parameter and external input *
- Mode 3 Reference via Target value and **F2** button
- Mode 4 Reference via Target value and external input **
- Mode 5 Reference drive positive via parameter with **F2** button **
- Mode 6 Reference drive positive via external input **
- Mode 7 Reference drive negative via **F2** button **
- Mode 8 Reference drive negative via external input **

* see parameter axis → X-/Y-axis → distances → reference value

** see parameter axis → X-/Y-axis → time → reference time

Additionally when positioning via PID resp. analog output:

- parameter axis → X-/Y-axis → analog → v. ref. mode 1
- parameter axis → X-/Y-axis → analog → v. ref. mode 2

General:

1. Above the **F2** button the reference symbol of the corresponding axis is displayed
2. An external input must be defined and allocated as "reference input"
3. See also chapter 7.2 "Referencing an Axis"

Spindle compensation mode

- without (no spindle compensation)
- negative spindle compensation –
- positive spindle compensation +
- with forced loop –
- with forced loop +

Software end-position

- both enabled
- negative disabled
- positive disabled
- both disabled

Hardware end-position

- both (defined inputs) enabled
- negative (defined input) disabled
- positive (defined input) disabled
- both disabled

Retract mode

- Mode 1 retract to actual value + adjusted retract length* with return
- Mode 2 retract to adjusted retract length* with return
- Mode 3 retract positive to actual value for the adjusted retract time** with return
- Mode 4 retract to actual value + adjusted retract length* without return
- Mode 5 retract to adjusted retract length* without return
- Mode 6 retract positive to actual value for the adjusted retract time** without return
- Mode 7 retract to actual value – retract length* with return
- Mode 8 retract negative to actual value for the adjusted retract time** with return
- Mode 9 retract to actual value – adjusted retract length* without return
- Mode10 retract negative to actual value for the adjusted retract time** without return

* see **parameter axis → X-/Y-axis → distances → retract length**

** see **parameter axis → X-/Y-axis → times → retract time**

Error compensation

The setting defines the activity of the error compensation at incremental measurement positioning.

- off
- on

Piece counter

This parameter is used to define the piece counter function for the Single Mode:




- without piece counter
 - auto decrement *
 - auto decrement + Stop *
 - auto increment *
 - auto decrement/ increment *
 - decrement **
 - decrement + Stop **
 - increment **
 - decrement/ increment **
- Setting "counter increment": the piece counter counts up from the current actual value.
 - Setting "counter decrement": the piece counter counts towards zero.
 - Setting "counter decrement/increment": the piece counter is decrementing if a certain number of items have been assigned. When zero is reached, the "quantity reached" output is set wiping according to the time deposited in parameter **parameter axis → X-/Y-axis → times → quantity reached**. Then the piece counter is incrementing.
- * When reaching the position the counter will be activated
 ** When activating the input "quantity" the counter will be activated

Incremental positioning

This parameter is used to activate the option "absolute / incremental positioning".

- off no selection possible, always absolute positioning
- on selection via keypad possible
- extern selection via external inputs possible

If this function is activated, one of the following symbols will appear (see 6.2 "Display Functions"):

-  target value is absolute position
-  target value is incremental position +
-  target value is incremental position -

If the function is deactivated, no symbol is shown the display and the positioning mode is generally absolute.

Decimal point

- This parameter is used to define a decimal place.

Display option manual

In this register the appearance of the manual button can be selected:

- left – right 
- down – up 
- forwards – backwards 

Unit

The displayed measurement unit can be specified here: mm, inch or degree.



NOTE! The units of the parameters remain unchanged!

9.4 Parameter Axis: Analog - optional

This menu is used to set the optional analog parameters for the X- and Y-axis separately.

Distances

Access to parameters concerning distances e.g. speeds etc.

Times

Access to parameters concerning times e.g. position reached, zero speed monitoring, rotary encoder etc.

Analog

Access to the analog output parameters

Settings

Access to the general axis parameters

Velocity

Acceleration

P-Portion

I-Portion

D-Position

I-Limit

Impulses encoder

Start mode

Stop mode

Stop mode manual

Manual fast

Manual slow

v Reference mode 1

v Reference mode 2

U fast forward

U slow forward

U creep forward

U fast backward

U slow backward

U creep backward



NOTE!

The analog parameters are only relevant for devices equipped with an optional analog output (PID or unregulated). See also ¶ 18 "Type Designation".

A detailed description of these parameters can be found on the next pages...

Please note: The optional analog parameters are only displayed in the menu “axis parameter” if an analog output has been previously assigned in the menu **parameter axis** → **X-/Y-axis** → **settings** → **axis type** to the corresponding axis. See figure 11 and section 14.2.

Setting for a regulated PID analog output:

Y-axis system		1/13
IN	axis type	OUT
Encoder	-- PID+Digital	

Setting for an unregulated analog output:

Y-axis system		1/13
IN	axis type	OUT
Encoder	-- Analog+Dig	

Figure 10: Assigning an analog output to an axis

Velocity

The maximum speed is set in this parameter (unit: rpm). Should there be gearing between the motor and the measuring system, this has to be considered in the calculations (e.g. gear or spindle).

Example!

Demanded (below the maximum possible!) motor speed rpm = 3000

Gearing ratio i = 10

$$V = (\text{rpm}) / i = (3000 \text{ rpm}) / 10 = 300 \text{ rpm}$$

Acceleration

The acceleration during positioning is set in this parameter in revolutions per square second ($\frac{[U]}{[s^2]}$)

A possible gearing ratio must also be considered here.

P-Portion

Integral step: setting range 1 ... 99999

General: The P-controller exclusively consists of a proportional portion and has thereby its reinforcing characteristic. The P-term multiplies the input value by a constant coefficient.

P40: At offset, the difference between the target and actual value is multiplied with the entered value and shown as power-sharing. The bigger the proportional amplification the more sensitive the control loop will be (possibly even unstable).

I-Anteil/I-Limit

Integral step: setting range 1 ... 99999

General: An I-controller (integrating controller) determines the control value through timed integration of the offset taking the reset time into account. A continuing offset leads to further increase of the analog output. The reset time determines how big the temporal influence is. The maximum reset time is limited through I-limit. The step response of the I-portion is a linear increase. That means for a constant offset the integral will be increased and thus reinforces the I-portion.

P40: At offset the analogue control voltage will continue to increase step by step until there is zero difference between the target and actual position and the entered I-limit in this parameter is reached respectively. The greater the I-portion, the slower is the response.

D-portion

Differential voltage: setting 1 ... 1000

General: The D-controller (differential controller) determines the control value from the derivative with respect to time of the offset.

P40: At offset a short voltage pulse proportional to the rate of change will be put out to compensate quickly without sacrificing the stability of the control loop permanently. The value of the voltage pulse is entered (max. ± 10 V).

Pulses encoder (resolution of the measuring system)

The number of pulses per revolution of the engine is entered in this parameter. This enables amongst others the calculation of speed to be effected (max. 9999 pulses per revolution).

Startmodus

Value	Mode
0	If the axis is in the tolerance zone, the axis will not be restarted.
1	A start of the axis will be forced in the tolerance zone.

Stoppmodus

Value	Mode
0	The voltage of the analog output is set to 0 V
1	The drive is set to shut down through the highest possible acceleration
2	The drive is set to shut down through an acceleration according to the adjusted parameter

Manual fast

Here the **fast** speed for moving the axis in manual mode can be defined.

Manual slow

Here the **slow** speed for moving the axis in manual mode can be defined.

v Reference mode 1

Here the reference run speed of the stopping point until reaching the initiator is defined.

v Reference mode 2

Here the reference run speed of stopping point until reaching the index pulse is defined.

U fast / slow / creep speed forward

Voltage during fast / slow / creep speed forward.

U fast / slow / creep speed backward

Voltage during fast / slow / creep speed backward.

9.5 Parameter Axis: Measuring System - optional

This menu is used to calibrate analog inputs. The submenu "measuring system" is only relevant for devices which are optionally equipped with an analog input (☞ 18 Type Designation).

Please note:

The submenu "Measuring system" appears only under "Axis parameters", if an analog measuring system has been assigned to the corresponding axis (parameter axis → X-/Y-axis → settings → axis type → IN). See also figure 11 and table ☞ 14.2.

X-axis system	1/14
IN axis type	OUT
Analog ---	Digital

Figure 11: Assigning an analog input to an axis

Distances

Access to parameters concerning distances e.g. speeds etc.

Times

Access to parameters concerning times e.g. position reached, zero speed monitoring, rotary encoder etc.

Measuring system

To calibrate analog measuring systems


Settings

Access to the general axis parameters

Measuring system calibration

9.5.1 Analog Input Calibration

calib measuring system		
X	[mm]	inc
min	0.0	0
max	90.0	4095
act	90.0	4095



A minimum and a maximum value for the lower voltage (offset) as well as the upper voltage (full scale) of the analog measuring system can be set during calibration.

The analogue input is designed for 0 ... 3.3 V, whereby 3.3 volts correspond to the full scale of 4095 increments (12 bits).

Example factory setting (see figure 12):

Min value: 0 V \cong 0.0 mm

Max value: 3.3 V \cong 90.0 mm

Figure 12: Analog Input Calibration

F1 **F3** With these two buttons, the minimum and maximum positions of the analog axis can be manually approached in the desired direction in order to calibrate them.

F2 Used as a teach button: After approaching the "min" and "max" position, the incremental measured value is assigned to the position, written into the corresponding field and stored.

See also section ☞ 14.1

10 System Menu

10.1 System: Setup

Setup

Access to the system parameters

System-Times

Access to system parameters concerning times

I/O-configuration

Here the inputs and outputs can be assigned

Default parameter

Reset the parameters to factory settings

Language

Axes active (only with two-axes-version)

Piece Counter program

Auxiliary Counter

Number of programs

Next set stepping

Options

Operating modes

PIN before Parameters

Sequence of axes (only with two-axes-version)

System equip



NOTE!

Setting the default parameters!

In the two-axis version, the default parameters for the I/O configuration are set depending on the active axes.

Only X-axis active: I/O configuration of the single-axis-version

X- and Y-axis active: I/O configuration of the two-axes-version

A detailed description of these parameters can be found on the next pages...

Language

- German
- English
- French
- Spanish
- Italian
- Polish
- Chinese

Axes active (only with two-axes-version)

- X-axis
- X-axis and Y-axis

Piece counter program

This parameter is used to set the mode of the piece counter during "program" operation.

- without no piece counter activated
- decrementing when position reached, piece counting is activated
- incrementing piece counting is activated via external input

If the piece counter reaches zero, the output is adjusted for a time corresponding to the time stored in **parameter system → system-times → piece counter prog**. In addition a next program step can be activated (this depends on further parameters).

Auxiliary counter

This parameter determines if an additional counter is available.

- without auxiliary counter
- program
- auto-program

If a program counter is activated, it is possible to specify in the "program mode" how many times a program is to be run through. If the program counter reaches zero, a new value entry is forced (even if zero was entered).

With the function "**auto program**" the next position will be automatically hit after a piece counting pulse ("piece counter program" has to be configured decrementing).

Number of program blocks

- 1 = 1000 blocks
- 2 = 500 blocks
- 5 = 200 blocks
- 10 = 100 blocks
- 20 = 50 blocks
- 25 = 40 blocks
- 40 = 25 blocks
- 50 = 20 blocks

Next set stepping

The following options can be selected for "next set stepping":

- without no next step setting activated
- quantity reached after expiration of the piece counter of the current set, the next set will be loaded
- quantity, set 1 same as "quantity reached", additionally set 1 will be loaded after program end

Options

- without no options selected
- auxiliary function auxiliary functions activated
- value retract retract value activated

Operating modes

This parameter determines which modes are possible:

- single set
- single set+ manual
- single set+ program
- single set+ manual + program

Pin before parameter

This parameter determines if the service/parameter-level can be achieved with or without password:

- off can be looked at without password, but cannot be changed
- on parameters can only be changed by using the password **250565**.

Sequence of axis (only with two-axes-version)

This parameter determines in which sequence the axes are going to move:

- X-axis, Y-axis (Y-axis drives after X-axis)
- Y-axis, X-axis (X-axis drives after X-axis)
- X-axis + Y-axis (axes drive at the same time)

System equip

- off diverse parameters are turned off
- on

10.2 System: System-Times

Setup

Access to the system parameters

System-Times

Access to system parameters concerning times

I/O-configuration

Here the inputs and outputs can be assigned

Default parameter

Reset the parameters to factory settings

Next set stepping

Clamping off

Editmode timeout

Piece counter prog

Clamp aux function

Next set stepping

This is the time setting in seconds (0.0 ... 9.9) how long the controller should wait in the program-mode, with auxiliary counter "auto-program" until the next set is positioned.

Clamping off

If the function „clamping off“ is assigned to an output (**system** → **I/O-configuration** → **output function**), the controller is waiting between setting the output and the start of positioning, as well as between resetting the output (after completion of positioning) and the release of the next action for the specified time (0.0 ... 9.9 s). This function is used to release (activate) e. g. a clamping system or brake right before (after) positioning.

Edit-mode timeout (no PIN necessary)

This is the time until exiting the input mode (0.0 ... 9.9 s, default setting: 2.0 s)

Piece counter program

Here the time is defined in seconds (0.0 ... 9.9), which presents the signal "quantity reached" in the program mode. If the values = 0, the output "quantity reached" is set statically.

Clamp auxiliary function

If the program mode „next program step“ has been chosen and the parameter **system** → **setup** → **options** → **auxiliary function** setting is „on“, the auxiliary function outputs are hold for the defined time (0.0 ... 9.9 in seconds). After this it is switched to the next set.

10.3 System: I/O Configuration

Setup

Access to the system parameters

System-Times

Access to system parameters concerning times

I/O-configuration

Here the inputs and outputs can be assigned

Default parameter

Reset the parameters to factory settings

Input function

Input logic

Output function

Output logic

10.3.1 Input Functions



NOTE!

For safety reasons (fail-safe), the logic default setting of the inputs „extern enable“, „external stop“ and „switch endpos min/max“, is „LOW active“.

External enable

The extern enable input is monitored during the positioning. If the input is activated, no positioning is possible respectively it will be cancelled with an error message.

External start

This input corresponds to the function of the button



External stop

This input corresponds to the function of the button



Setting the reference

If the **parameter axis → X-/Y-axis → settings → reference mode** is set to 2, 4, 6 or 8, the actual value can be calibrated by activating this input:

- Mode 2: Reference via external input (**parameter axis → X-/Y-axis → distances → referenceval.**)
- Mode 4: Reference via target value + ext. input (Reference value: set target value)
- Mode 6: Reference positive via external input

- Mode 8: Reference negative via external input

Incremental positioning negative

If this input is active, the incremental positioning is in negative direction, if incremental positioning is externally configured (**parameter axis → X-/Y-axis → settings → incremental positioning → external**).

Incremental positioning positive

If this input is active, the incremental positioning is in positive direction, if incremental positioning is externally configured (**parameter axis → X-/Y-axis → settings → incremental positioning → external**).

Retract function

The retract function will be started if the input is activated

Piece counter

With every pulse at this input, the current quantity is increased or decreased by one piece.
Settings: **parameter axis → X-/Y-axis → settings → piece counter**

- decrement
- decrement + stop
- increment
- increment/decrement

Switch endposition min/max

- switch end-pos. min
- switch end-pos. max

The switch end-position inputs are monitored during the positioning. If a switch end-position input is activated, no positioning in the corresponding direction is possible respectively the positioning will be cancelled.

Key manual mode <Axis +/->

If an input is assigned here, the corresponding axis can be positioned in the corresponding direction via an external key in the manual mode (joystick-function).

Tool offset

As long as this input is activated, the **parameter axis → X-/Y-axis → distances → toolcorrection** will be added to the actual value.

Fix position

If the input is activated the axis moves to the fix position which is defined in **parameter axis → X-/Y-axis → distances → fixposition**

Enable axis

The input is monitored during the positioning. If the input is activated, no more positioning is possible resp. the positioning is canceled and an error message is set.

10.3.2 Output Functions

Position reached (wiping / statically)

If 0.0 s is entered in **parameter axis → X-/Y-axis → times → pos. reached**, the output switches statically i.e. the output is active, after the target value has been reached.

If a wiping time between 0.1 ... 99.9 s is entered, the output will be active until the entered wiping time has expired.

Drive Signal

The drive signal outputs are individually configurable via **parameter axis → X-/Y-axis → settings → drivesignals** (☞ 9.3).

Control enable

Before a positioning the signal control enable is set. After reaching the target position and only after expiration of the time in **parameter axis → X-/Y-axis → times → delay contr.enable**, the signal control enable is reset.

Quantity reached (wiping / statically)

If 0.0 s is entered in **parameter axis → X-/Y-axis → times → quantity reached**, the output is set statically when the quantity is reached. When pressing START, the output is reset.

If a wiping time between 0.1 ... 99.9 s is entered, the output will be active until the entered wiping time has expired.

Tolerance window <Axis>

If the current actual position corresponds to the target value +/- the value entered in **parameter axis → X-/Y-axis → distances → tolerancewindow**, this output is set.

Reference drive

This output is set during a reference drive

Tool enable

In manual mode: the output is set when changing into the manual mode and is reset during a positioning.

In single and program mode: the output is reset when changing in one of these modes and is set after each positioning. The output can be reset via STOP button.

Program - end

The output is set, after the program block with end marker has been processed. If „program“ resp. „auto-program“ has been selected in **system → setup → auxiliary counter**, the number of program sequences has to be reached additionally.

Auxiliary function

In the single and program mode these outputs are set according to the defined time in parameter **system** → **system-times** → **clamp aux function**

Clamping

This output is set before a positioning and is reset after a positioning (e. g. for a clamping system or in order to activate resp. release the brake). The corresponding time can be defined in parameter **system** → **system-times** → **clamping off**

All axes on position (only two-axis version)

If both current actual values correspond to the according target positions +/- the value entered in parameter **axis** → **X-/Y-axis** → **distances** → **tolerancewindow**, this output is set.

Retract s1 axis


This output is active during retract.

10.3.3 Input and Output Configuration

The inputs and outputs with their associated logic can be configured freely.

10.3.3.1 Linking of Inputs with Functions

Chapter 15 I/O Configuration Notation Table contains an overview of all functions which can be assigned to the inputs. After selecting a function via parameter **system** → **I/O-configuration** → **input function** by using the navigation buttons. The desired input for this function can be selected by pressing the ENTER button.

If a previously used input needs to be reset, the  button can be used, to set the input to the "not used" state. Further it is possible to press the ENTER key repeatedly until "not-used" appears in the display. A multiple use of inputs is not possible here. If an input is already used, only the next free input can be chosen automatically.

IN assignment	1/26	IN logic	1/26
switch endpos X-min		switch endpos X-min	
ST4 (S14)	- P03		low active
switch endpos X-max		switch endpos X-max	
	not used		low active
switch endpos Y-min		switch endpos Y-min	
	not used		low active

Figure 13: Input assignment

10.3.3.2 Input Logic Assignment

After the inputs of the controller have been assigned with functions, parameter **system** → **I/O-configuration** → **input logic** can be used to determine whether the corresponding input function should be triggered to a logic HIGH level or a logic LOW level. The logic is assigned by selecting the corresponding function and pressing the ENTER button.

10.3.3.3 Linking of Outputs with Functions

Chapter 15 I/O Configuration Notation Table contains an overview of all functions which can be assigned to the inputs. After selecting a function via parameter **system** → **I/O-configuration** → **output function** by using the navigation buttons. The desired output for this function can be selected by pressing the ENTER button.

If a previously used output needs to be reset, the  button can be used, to set the output to the “not used” state. Further it is possible to press the ENTER key repeatedly until “not-used” appears in the display. A multiple use of outputs is not possible here. If an input is already used, only the next free output can be chosen automatically.

OUT assignment			1/23	OUT logic			1/23
drive signal	1	X-axis		drive signal	1	X-axis	
ST5 (S11)	-	P03		high active			
drive signal	2	X-axis		drive signal	2	X-axis	
ST5 (S11)	-	P04		high active			
drive signal	3	X-axis		drive signal	3	X-axis	
ST5 (S11)	-	P05		high active			

Figure 14: Output assignment

10.3.3.4 Output-Logic Assignment

The outputs can also be assigned with an active HIGH or LOW logic depending on the selected output function. The setting follows the same procedure as already described in section 10.3.3.2 Input Logic.

10.4 System: Default Parameters

With this parameter, the device can be reset to its factory settings (default parameters).

Possible key functions are:

F3

Cancel the operation

F2

The factory parameters are loaded immediately and then effective. All values and configurations previously stored in the controller are deleted / overwritten!



WARNING!


By loading the factory parameters, all individually configured or customer-specific parameter settings as well as assignments of the inputs and outputs are lost.

It is recommended to note the original settings on a sheet of paper before the control is reset. You can also use our note table for your individual I / O configuration (see chapter 15).

11 Password Menu


The password for the PIN query is entered in the **Password** menu.


The entered password must be confirmed by pressing button  or **F2**.


	<p>NOTE!</p> <p>The parameter level is saved by a password.</p> <p>Required PIN CODE: 250565</p> <p>After entering the password / PIN code, all parameters can be edited.</p>
---	---

12 Contrast Menu

This menu is used to adjust the contrast of the display.
The following buttons are used:

 Increase contrast

 Decrease contrast

Press **ESC** or  to exit

13 Diagnosis / Error Messages Menu

13.1 Diagnosis

This menu contains a function to test the hardware and to display the current installed hard- and software version.

- Inputs
- Outputs
- Keypad
- Version/Info

13.2 Error Messages and Error Handling

The following table shows possible errors and their handling.

Table 1: Error Messages and Error Handling

Error No.	Meaning	Possible causes and remedies
01	Hardware end switch minimum axis X active!	Check the signals/wires of the corresponding input or deactivate the according input function (☞ 10.3.3.1 Linking of Inputs with Functions).
02	Hardware end switch minimum axis X active!	
04	Hardware end switch minimum axis Y active!	
05	Hardware end switch maximum axis X active!	
16	External stop on error active!	
25	No enable!	
07	Software end position minimum axis X fell below!	Check the corresponding parameter or deactivate the according software end position (☞ 9.3 Parameter Axis: Settings).
08	Software end position minimum axis Y fell below!	
10	Software end position maximum axis X fell above!	
11	Software end position maximum axis Y fell above!	
13	No measuring system axis X!	Check the according measuring system resp. the encoder signals/wires
14	No measuring system axis Y!	
17	Power failure. Switch on control again and check the axis-position	If the voltage drops below approx. 18 V, all axes are stopped, all outputs are set to 0, an error message occurs and the controller remains in a waiting state. The device can only be re-activated by re-applying the supply voltage.
18	Access denied	You have no authorisation to process this function or you have not entered a password (PIN), respectively the wrong one (☞ 11).
24	GFI structure	Internal error (please contact the manufacturer)

After troubleshooting, the following measures must be taken:

- See section ☞ 17.2 Re-start after Fault Clearance

14 Parameter Lists

14.1 Parameter Axis: Distances

Table 2: Axis parameter list: Distances

Function	Range	Default Setting
Slow forward	0.0 ... 9999.9 *	15.0
Creep forward	0.0 ... 9999.9 *	15.0
Correction stop forward	0.0 ... 9999.9 *	0.0
Slow backward	0.0 ... 9999.9 *	15.0
Creep backward	0.0 ... 9999.9 *	15.0
Correction stop backward	0.0 ... 9999.9 *	0.0
Tolerance window	0.0 ... 9999.9 *	0.0
Manipulation	0.0 ... 9999.9 *	0.0
Spindle compensation	0.0 ... 9999.9 *	5.0
Forced loop	0.0 ... 9999.9 *	1.0
Reference value	-9999.9 ... 9999.9 *	0.0
Retract length	0.0 ... 9999.9 *	5.0
End position min.	-99999.9 ... +99999.9 *	-2000.0
End position max.	-99999.9 ... +99999.9 *	+2000.0
Factor	0.0 ... 9.999999	0.100000
Displacement	-9999.9 ... +9999.9 *	0.0
Tool correction	0.0 ... 9999.9 *	0.0
Fix position	-9999.9 ... +9999.9 *	0,0

* = dependent on decimal point setting (particulars with 1/10)

14.2 Parameter Axis: Times

Table 3: Axis parameter list: Times

Function	Range	Default Setting
Position reached	0.0 ... 99.9 [s]	1.0
Spindle compensation	0.0 ... 99.9 [s]	1.0
Manual change	0.0 ... 99.9 [s]	1.0
Monitoring	0.0 ... 99.9 [s]	0.0
Delay Control enable	0.0 ... 99.9 [s]	1.0
Start delay	0.0 ... 99.9 [s]	0.0
Shutdown control	0.0 ... 99.9 [s]	0.0
Retract time	0.0 ... 99.9 [s]	1.0
Delay retract time	0.0 ... 99.9 [s]	0.0
Reference time	0.0 ... 99.9 [s]	1.0
Quantity reached	0.0 ... 99.9 [s]	0.0

14.3 Parameter Axis: Analog - optional

Please note: The optional analog parameters are only displayed in the menu “axis parameter” if an analog or PID output has been previously assigned in the menu **parameter axis** → X-/Y-axis → **settings** → **axis type** to the corresponding axis (☞ 9.4 Parameter Axis: Analog - optional).

Table 4: List of analog parameters

Function	Range	Default Setting
Velocity	0 ... 9999 [U/min]	3000
Acceleration	0 ... 9999 [U/s ²]	50
P-Portion	0 ... 99999	5
I-Portion	0 ... 99999	3
D- Position	0 ... 99999	1
I-Limit	0 ... 99999	10
Impulses encoder	0 ... 9999	360
Start mode	0, 1	1
Stop mode	0, 1, 2	1
Stop mode manual	0, 1, 2	1
Manual fast	0 ... 9999 [U/min]	2000
Manual slow	0 ... 9999 [U/min]	1000
v Reference mode 1	0 ... 9999 [U/min]	500
v Reference mode 2	0 ... 9999 [U/min]	250
U fast forward	0 ... 9.9 [Volt]	3.0
U slow forward	0 ... 9.9 [Volt]	2.0
U creep forward	0 ... 9.9 [Volt]	1.0
U fast backward	0 ... 9.9 [Volt]	-3.0
U slow backward	0 ... 9.9 [Volt]	-2.0
U creep backward	0 ... 9.9 [Volt]	-1.0

14.1 Parameter Axis: Measuring System - optional

This menu is used to calibrate the analog inputs, when analog measurement systems or sensors are used.

Please note: This menu contains optional parameters, which are only accessible if an analog measuring system has been assigned to the corresponding axis in **parameter axis** → X-/Y-axis → **settings** → **axis type** → **IN** (☞ 9.5 Parameter Axis: Measuring System - option).

Table 5: Calibration of analog Inputs

Function		Range	Default Setting
minimum	angle, distance	-99999,9 ... +99999,9 [°, mm]	0
complies	transformer increment	0 ... 4095	0
maximum	angle, distance	-99999,9 ... +99999,9 [°, mm]	+90.0
complies	transformer increment	0 ... 4095	4095

14.2 Parameter Axis: Settings

Table 6: List of general axis parameters

Function	Range	Default Setting
Axis type	Measuring system - - - drive outputs	
	Encoder - - - Digital	X
	Encoder - - - PID + Digital	
	Analog - - - Digital	
	Encoder - - - Analog+ Digital	
	Analog - - - Analog+ Digital	
Button manual mode	normal, inverted, off	normal
Drive signal configuration	Mode 1, 2, 3, 4, 5, 6, 7, 8	Mode 2
Reference mode	Mode 1, 2, 3, 4, 5, 6, 7, 8	Mode 1
Spindle compensation mode	without with spindle +/- forced loop +/-	without
Software end-position	both enabled negative disabled positive disabled both disabled	both enabled
Hardware end-position	both enabled negative disabled positive disabled both disabled	both enabled
Retract mode	Mode 1, 2, 3, 4, 5, 6, 7, 8, 9, 10	Modus 1
Error compensation	off/on	off
Piece counter	without auto decrement auto decrement + stop auto increment auto decrement / increment decrement decrement + stop increment decrement / increment	auto decrement
Incremental positioning	off/on	on
Decimal point	without, 1/10, 1/100, 1/1000	1/10
Display option manual	left-right down-up forward-backward	left-right
Unit	mm / inch / degree	mm

14.3 System: Setup

Table 7: List of system parameters: setup

Function	Range	Default Setting
Language	English / Francais / Castellano / Italiano / Polski / Chinese / Deutsch	English
Axes active (only with two-axes-version)	X-axis X-axis + Y-axis	X-axis + Y-axis
Piece Counter program	decrement without auto decrement	auto decrement
Auxiliary Counter	without program auto-program	without
Number of programs	1, 2, 5, 10, 20, 25, 40, 50	50
Next set stepping	without quantity reaches quantity reaches + set 1	quantity reaches
Options	without / auxiliary function/ value retract	without
Operating modes	single single+ manual single+ program single+ manual + program	single+ manual+ program
PIN before Parameter	off/on	off
Sequence of axis (only two-axis version)	X-axis, Y-axis Y-axis, X-axis X-axis + Y-axis	X-axis, Y-axis
System equip	off/on	on

14.4 System: Times

Table 8: List of system parameters: times

Function	Range	Default Setting
Next set stepping	0.0 ... 9.9 [s]	0.0
Clamping off	0.0 ... 9.9 [s]	0.0
Edit-mode timeout	0.0 ... 9.9 [s]	2.0
Piece counter program	0.0 ... 9.9 [s]	0.0
Clamp auxiliary function	0.0 ... 9.9 [s]	0.0

15 I/O Configuration Notation Tables

The following tables are used to note an individual input and output configuration:

Table 9: Notation table for input configurations

Function \ Input	ST3								ST4 (with option 16 I/O configurable)								Logik	
	3	4	5	6	7	8	9	10	3	4	5	6	7	8	9	10	default	customer
Switch endpos X-min																	L	
Switch endpos X-max																	L	
Switch endpos Y-min																	L	
Switch endpos Y-max																	L	
Retract X-axis																	H	
Retract Y- axis																	H	
Reference X- axis																	H	
Reference Y- axis																	H	
Extern enable																	H	
Extern Start																	H	
Extern Stop																	L	
Piece counter X																	H	
Displacement X																	H	
Displacement Y																	H	
Button manual X+																	H	
Button manual X-																	H	
Button manual Y+																	H	
Button manual Y-																	H	
Fix position X																	H	
Fix position Y																	H	
Start X-axis																	H	
Start Y-axis																	H	
Enable X-axis																	H	
Enable Y-axis																	H	
Switch endpos X-min																	H	
Switch endpos X-max																	H	
Switch endpos Y-min																	H	
Switch endpos Y-max																	H	

"L" corresponds to input "LOW active", "H" corresponds to input "HIGH active"

Table 10: Notation table for output configurations

Function \ Output	ST5								ST6 (with option 16 I/O configurable)								Logic	
	3	4	5	6	7	8	9	10	3	4	5	6	7	8	9	10	default	customer
Drive signal 1 X-axis																	H	
Drive signal 2 X-axis																	H	
Drive signal 3 X-axis																	H	
Drive signal 4 X-axis																	H	
Drive signal 1 Y-axis																	H	
Drive signal 2 Y-axis																	H	
Drive signal 3 Y-axis																	H	
Drive signal 4 Y-axis																	H	
Control enable X-axis																	H	
Control enable Y-axis																	H	
Position reached X-axis																	H	
Position reached Y-axis																	H	
Tolerance zone X-axis																	H	
Tolerance zone Y-axis																	H	
Reference drive X-axis																	H	
Reference drive Y-axis																	H	
Quantity reached																	H	
All axis in position																	H	
Tool enable																	H	
Program-ende																	H	
Clamping																	H	
Retract s1 X-axis																	H	
Retract s1 Y-axis																	H	
Drive signal 1 X-axis																	H	
Drive signal 2 X-axis																	H	
Drive signal 3 X-axis																	H	
Drive signal 4 X-axis																	H	

"L" corresponds to input "LOW active", "H" corresponds to input "HIGH active"

16 Connections

16.1 Plug Arrangement

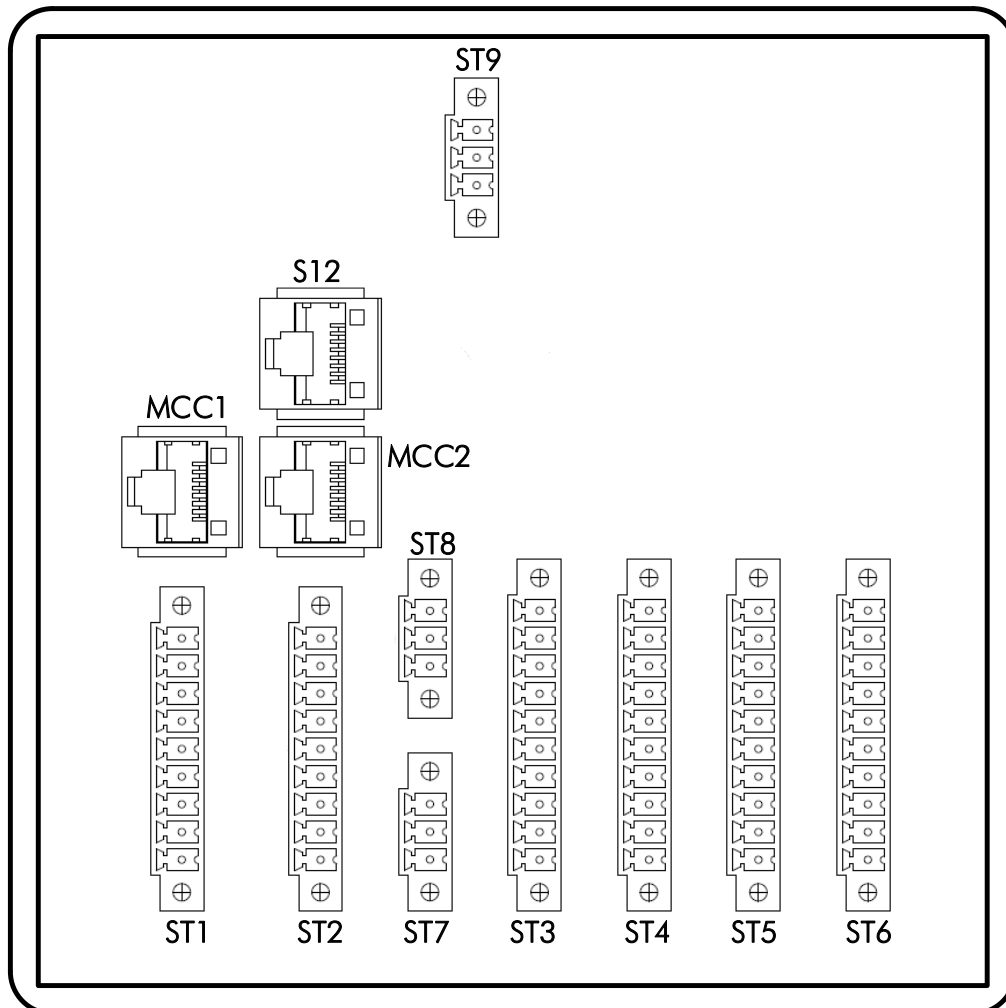


Figure 15: Plug arrangement

Plug No.	Purpose
ST1	Measuring system connection
ST2	Measuring system connection (only at 2-axes-version)
ST3/ST4	Digital inputs
ST5/ST6	Digital outputs
ST7	Analog output (PID)
ST8	Analog output 2 (PID) (only at 2-axes-version)
ST9	Voltage supply
MCC1	Control signal 1 (PID)*
MCC2	Control signal 2 (PID)* (only 2-axis version)
S12	PC interface (RS232)

*) e.g. combined with Motor Drive Controller P100 MCC



NOTE!

The analog output is only available if this option has been ordered.
See section 18 Type Designation → Option “Analog output 1 or 2”.

16.2 Pin Assignment

(default assignment – factory settings)

Table 11: Measuring system connections

ST1	Incremental Measuring System	ST2	Incremental Measuring System
1	0 V / GND	1	0 V / GND
2	+ 24 VDC out (optionally 5 VDC)	2	+ 24 VDC out (optionally 5 VDC)
3	Channel A	3	Channel A
4	Channel B	4	Channel B
5	PE	5	PE
6	Channel A'	6	Channel A'
7	Channel B'	7	Channel B'
8	Channel Z (index pulse)	8	Channel Z (index pulse)
9	Channel Z' (index pulse)	9	Channel Z' (index pulse)

Table 12: Input connections

ST3	Inputs			ST4	Inputs	
	1-axis 8 I/O	1-axis 16 I/O	2-axis 16 I/O		1-axis 16 I/O	2-axis 16 I/O
1	0 V / GND			1	0 V / GND	0 V / GND
2	+ 24 VDC out			2	+ 24 VDC out	+ 24 VDC out
3	Start			3	NC	NC
4	Stop			4	NC	NC
5	Reference			5	NC	Reference Y
6	Piece counter			6	NC	NC
7	Retract			7	NC	Retract Y
8	End min			8	NC	End min Y
9	End max			9	NC	End max Y
10	Displacement			10	NC	Displacement Y

Table 13: Output connections

ST5	Outputs		
	1-axis 8 I/O	1-axis 16 I/O	2-axis 16 I/O
1	0 V / GND		
2	+ 24 VDC out		
3	Drive signal 1 X		
4	Drive signal 2 X		
5	Drive signal 3 X		
6	Drive signal 4 X		
7	Position reached X		
8	Quantity reached X		
9	Control enable X		
10	Tolerance window X		

ST6	Outputs	
	1-axis 16 I/O	2-axis 16 I/O
1	0 V / GND	0 V / GND
2	+ 24 VDC out	+ 24 VDC out
3	Auxiliary function 1	Drive signal 1 Y
4	Auxiliary function 2	Drive signal 2 Y
5	Auxiliary function 3	Drive signal 3 Y
6	Auxiliary function 4	Drive signal 4 Y
7	Reference runs	Position reached Y
8	NC	NC
9	NC	Control enable Y
10	NC	Tolerance zone Y

Table 14: Analog / PID output connections

ST7/8	Analog output / PID output
1	0 V / GND
2	Analog out
3	PE

Table 15: Power supply connections

ST9	Power Supply input
1	0 V / GND
2	+ 24 VDC
3	PE

Table 16: Analog output / motor drive controller MCC

MCC1	Analog out / Motor Drive Controller MCC	MCC2	Analog out / Motor Drive Controller MCC
1	Control enable or CAN L (J1)	1	Control enable or CAN L (J2)
2	NC or CAN H (R1)	2	NC or CAN H (R2)
3	Encoder A	3	Encoder A
4	Encoder B	4	Encoder B
5	Encoder A'	5	Encoder A'
6	Encoder B'	6	Encoder B'
7	Target value analog	7	Target value analog
8	0 V / GND	8	0 V / GND



NOTE!

At the RJ45 socket ST12 (serial RS232 PC interface) no wiring is required.
A suitable interface cable is available as accessory part (☞ 19 Accessories).

16.3 Connection Example Diagram

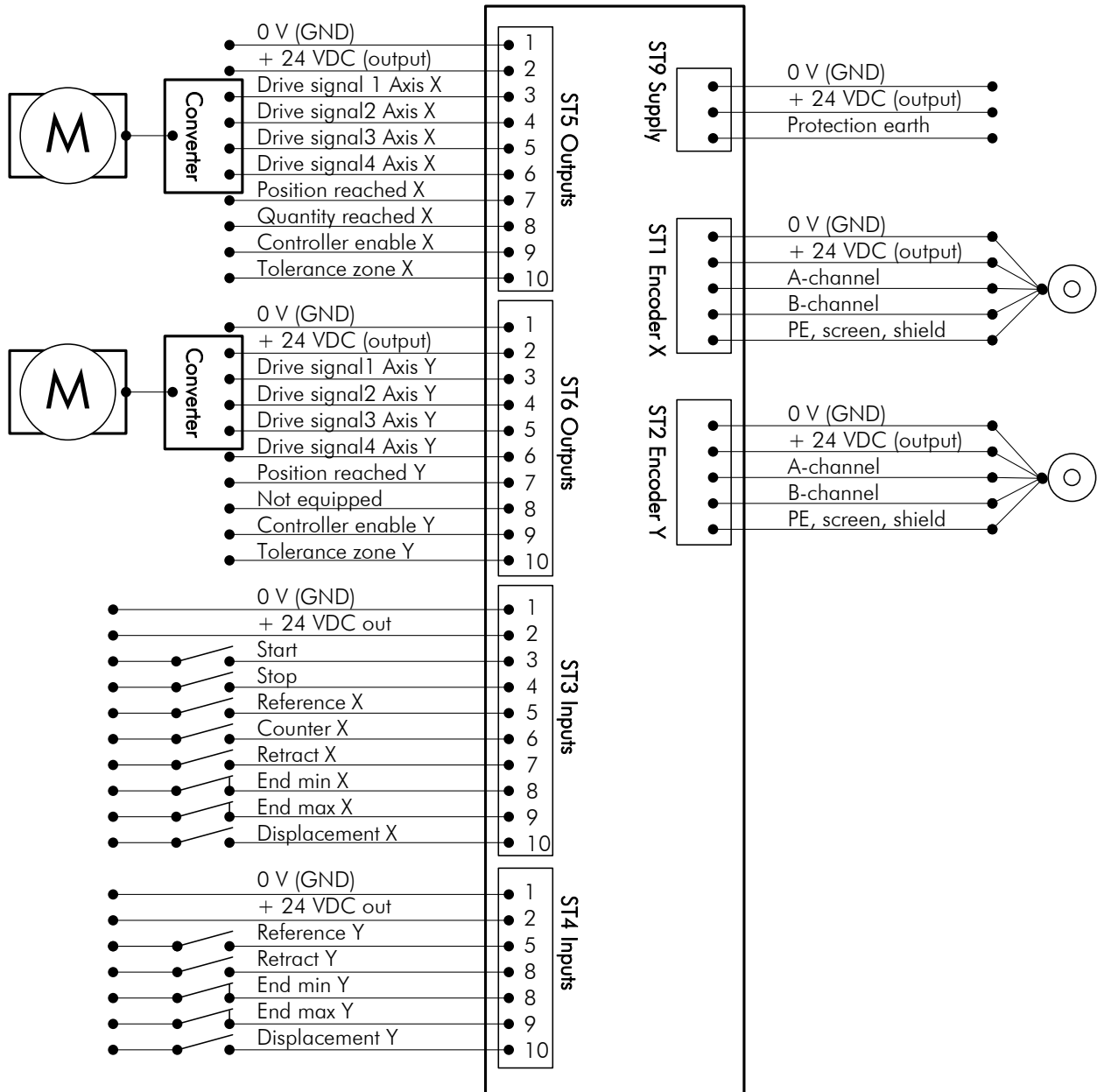


Figure 16: Connection example diagram

17 Disturbances, Maintenance, Cleaning

This chapter describes possible causes for disturbances and measures for their removal. In case of increased disturbances, please follow the measures for fault clearance in chapter 17.1. In case of disturbances that cannot be eliminated by following the advice and the fault clearance measures given here, please contact the manufacturer (see second page).

17.1 Fault Clearance



CAUTION!

The device, the connection line and the signal cable must not be installed next to sources of interference that emit strong inductive or capacitive interference or strong electrostatic fields.

External perturbations can be avoided through suitable cable routing.



The screen of the signal output cable should only be connected to the following circuit on one side. The screens should not be grounded on both sides. Signal cables always have to be routed separately from the load power line. A safety distance of at least 0.5 m has to be kept from inductive and capacitive sources of interference such as contactors, relays, motors, switching power supplies, clocked controllers etc.!

If interferences occur in spite of all the items stated above being observed, please proceed as follows:

1. Installation of RC-circuits via contactor coils of AC-contactors (e.g. 0.1 μ F / 100 Ω)
2. Installation of recovery diodes via DC-inductors
3. Installation of RC-circuits via the different motor phases (in the terminal box of the motor)
4. Do not connect protective earth and ground
5. Connect a mains filter ahead of the external power pack

17.2 Re-start after Fault Clearance

After the fault clearance:

1. Reset the emergency stop mechanism if necessary
2. Reset the error report at the super-ordinate system if necessary.
3. Ensure that there are no persons in the danger area.
4. Follow the instructions from chapter 5.



WARNING!

Danger of injury through non-conventional fault clearance!

Non-conventional fault clearance can lead to severe injuries and damage of property.

Therefore:

- Any work to clear the faults may only be performed by sufficiently qualified staff
- Arrange enough space before starting the works
- Make sure that the mounting area is clean and tidy. Loose components and tools are sources of accidents.

If components need to be replaced:

- Pay attention to a correct installation of the spare parts.
- Reinstall all the fixing elements properly
- Before turning on the device, ensure that all covers and safety equipment is installed correctly and functions properly

17.3 Maintenance

The device is maintenance-free.

**WARNING!**

Danger through non-conventional maintenance!

Non-conventional maintenance can lead to severe injuries and damage of property.

Therefore:

Maintenance works may only be completed by staff that has been authorized and trained by the operator.

17.4 Cleaning

**WARNING!**

The device can only be cleaned with a damp cloth, do not use aggressive cleanser!

18 Type Designation

P40 - 000 - 024 - XX - XX - XXXX

Device Designation:

P40 = Position Controller for 1 or 2 axes

Version:

000 = standard version

001 = first special version

002 = second special version (etc.)

Power Supply Voltage:

024 = 24 VDC (+10 / -20 %)

Encoder Inputs (per Axis):

X = input is not available

1 = A, B, Z (PNP) 24 V supply / HTL, 100 kHz

2 = A, A', B, B', Z, Z' 24 V supply / TTL 100 kHz

3 = A, A', B, B', Z, Z' 5 V supply / TTL 100 kHz

4 = 1 analog inputs 3.3 V supply / 0 ... 3.3 V (12 bit)¹

5 = 2 analog inputs 3.3 V supply / 0 ... 3.3 V (12 bit)²

6 = A, B, Z (PNP) 24 V supply / HTL, 100 kHz³

+ 1 analog input 3.3 V supply / 0 ... (customer specified)

Analog Output (per Axis):

X = no analog output (switch-off positioning)

1 = 12 bit analog output ± 10 V (PID regulated)⁴

2 = 12 bit analog output ± 10 V (unregulated)

Options:

X = no further options

C = screw terminals

8 = 8 digital inputs / 8 digital outputs⁵

Restrictions:

¹ for special applications (e. g. as auxiliary axis)

² for special applications, analog inputs only for and on plug 2. Axis

³ for special applications and only possible for 2. Axis

⁴ not possible with "Encoder Inputs = 4 or 5"

⁵ not possible for two axes and not possible with analog output



NOTE

When ordering, please use the here described ordering code (Type Designation).
Options that are not required are filled in with „-“.

19 Accessories

The following table shows the available accessories as well as the respective order designation:

Table 17: Accessories

Order designation	Description
NG 13.0	Power pack for AC-supply (primary: 115/230 VAC, secondary: 24 VDC/600 mA)
RP8K	Relay card with 4 shutter relays and 4 changeover relays (28 VDC/250 VAC / 12 A)
P40 Interface Cable	Interface cable for PC connection (with RJ45 connector and female 9-pin SUB-D)

Notes:

20 Index

Accessories	69	Operating area	12
Accident prevention regulations	6	Operating Modes	9
Activation of the device	12	Operational safety	6
Analog Input Calibration	41	Output Functions	50
Axis Menu	22	Output-Logic Assignment	52
Causes of risk	7	Packaging material	8
Cleaning	66, 67	Parameter Axis - Analog	37
Connection Example Diagram	65	Parameter Axis - Distances	22
Connections	61	Parameter Axis - Measuring System	41, 56
Contrast Menu	53	Parameter Axis - Settings	29
Conventional use	8	Parameter Axis - Times	27
Create a Program	18	Parameter Lists	55
Demounting	7	Password Menu	53
Device number	10	Pin Assignment	62
Diagnosis	54	Plug Arrangement	61
Dimensions	10	Processing a Program	19
Display Functions	14	Product Features	9
Disposal	7	Program Operation	18
Disturbances	66	Protection against contact	12
Error Messages	54	Protective equipment	7
Essential P40 Features	9	Referencing an Axis	19
Explanation of symbols	6	Safety	6, 7
Fault clearance	66	Safety instructions	6
First start-up	12	Safety rules	6
Functionality of Referencing	19	Single Operation	17
Handling & Modes	15	Start-up	12
I/O Configuration	51	Storage	8
I/O Configuration Notation Tables	59	System	
Identification	10	Setup	42
Input Functions	46	System – Default Parameters	52
Input Logic Assignment	51	System - I/O Configuration	46
Installation	12	System - System-Times	45
Key Functions	13	System Menu	42
Linking of Inputs with Functions	51	Technical Data Controller	11
Linking of Outputs with Functions	52	Transport	8
Maintenance	66, 67	Transport damage	8
Manual Operation	15	Type designation	10
Menu Structure and Parameter Levels	21	Typen Desigantion	68
Mounting / Installing	12		

Document- No.: 799000347 / Rev. 12
Document- Name: P40-000-MA-E_39-20
Subject to change - © 2020
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