

Operation Manual

Series P40-SN002

Application metal shears
Programmable controller



- LCD Display
- Simple handling
- Manual function
- Single set operation
- Program memory
- Digital outputs
- Analog Output
- Material depending Voltage output

Content

Content.....	2
1. General Information.....	4
1.1. Information Operation Manual.....	4
1.2. Explanation of Symbols.....	4
1.3. Warranty conditions	5
1.4. Demounting and Disposal.....	5
2. Safety.....	6
2.1. General Cause of Risks	6
2.2. Personal Protective Equipment.....	6
2.3. Intended Use	7
3. Transport and Storage.....	8
3.1. Safety hints for Transport, Unpacking and Loading.....	8
3.2. Handling of Packaging Material	8
3.3. Check of Transport.....	8
3.4. Storage	8
4. Product Features.....	9
5. Technical Data.....	10
5.1. Dimensions.....	11
6. Configuration and Functions	12
6.1. Elements.....	12
6.1.1. Control Elements.....	12
6.1.2. Display Elements	12
6.1.3. Function of Keys.....	13
6.2. Menus, sections and parameters.....	14
6.2.1. Axis Menu / Length.....	15
6.2.2. Axis Menu Length Parameters	16
6.2.3. Axis menu / times.....	20
6.2.4. Parameters of time	21
6.2.5. Axis menu / analog output.....	22
6.2.6. Analog output parameters	23
6.2.7. Axis menu / Configuration	26
6.2.8. System parameters	27
6.2.9. Material Table	31
6.2.10. Explanation of the Interpolation	31
6.2.11. Menu / System.....	32
6.2.12. System Settings	33
6.2.13. Additional Settings.....	34
6.3. Machine setting.....	35
6.3.1. Gap Setup (Cut gap)	35
6.3.2. Angle Setup (cut angle).....	35
6.3.3. Cutting length Setup.....	35
6.4. Configuration of inputs and outputs.....	36
6.4.1. Link-up the inputs with functions	36
6.4.2. Allocation to the logic input functions.....	36
6.4.3. Linking the outputs of functions.....	36
6.4.4. Logic Allocation to Outputs.....	36
7. Operation	37
7.1. Operation Modes	37
7.1.1. Manual mode.....	37
7.1.2. Single mode	37
7.1.3. Program mode.....	37

7.1.4.	Reference	38
7.2.	Connector pin assignment	39
7.2.1.	Overview Terminal Assignment.....	40
	Error Codes 41	
7.2.2.	Description of Inputs.....	41
7.2.3.	Description of Outputs.....	42
7.2.4.	Example for Connection Diagram.....	43
7.3.	Diagnostics.....	43
8.	Interferences	44
8.1.	Security	44
8.2.	Electrical interference suppression.....	45
8.3.	Restart after fault clearance.....	45
8.4.	EMC information.....	45
9.	Maintenance.....	46
10.	Type Designation.....	47
11.	Accessories	48

1. General Information

1.1. Information Operation Manual

The manual contains important information regarding the handling of the indicator.
For your own safety and operational safety, please observe all warnings and instructions!

Precondition for safe operation is the compliance with the specified safety and handling instructions.
Moreover, observe the existing local accident prevention regulations and general safety rules.




Please read the operation manual carefully before starting to work. The manual must be kept accessible for staff at any time. The illustrations are for a better representation in the manual. They are not necessarily to scale and can be slightly different from the actual device.

1.2. Explanation of Symbols

Warning notices are marked by symbols in the operation manual.
The warnings will be introduced by signal words to express the magnitude of the danger.

Strictly observe these warnings in order to avoid accidents and injuries to persons and property.

Warning notices:

	DANGER! This symbol in connection with the signal word „Danger“ indicates an immediate danger for the life and health of persons. Failure comply with these instructions may result in serious damage to health and even life-threatening injuries.
	WARNING! This symbol in connection with the signal word „Warning“ indicates a potential danger to the life and health of persons. Failure comply with these instructions may result in serious damage to health and even life-threatening injury.
	CAUTION! This symbol in connection with the signal word „Caution“ indicates a potentially dangerous situation. Failure to comply with these instructions can result in minor injuries or property damage.

Special safety notices:**DANGER!**

...marks life-threatening situations by electrical current. Failure to observe these safety instructions may result in severe or even fatal injuries. The operations have to be carried out only by an electrician.

Tips and recommendations:**Note!**

Highlights, useful tips, information and recommendations for efficient and trouble-free operation.

1.3. Warranty conditions

The warranty conditions are stated in a separate document, which is part of your sales documents.

Guarantee

The producer guarantees the functional capability of the technology and the stated parameters. The period of warranty is one year and begins on the date of delivery.

1.4. Demounting and Disposal

If there is no agreement on our taking back and disposing of the products, dismantle the device observing the safety instructions given in this manual and dispose the device in accordance with the corresponding environmental regulations.

Before demounting

- Disconnect the power supply
- Secure against re-start
- Disconnect supply lines physically and discharge remaining energy
- Remove operating, auxiliary materials operating supplies with respect to the environment

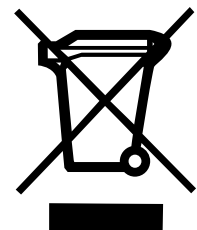
Disposal

Recycle the unwanted elements:

- Metal elements go in metal waste
- Electronic components go in electronic scrap
- Recycle plastic parts
- Dispose of the remaining components according to their material


**CAUTION!**

Wrong disposal → damage caused to the environmental damage!
Electrical scrap, electronic components, lubricants and operating require special waste. Treatment must only be disposed by approved specialist companies.



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

2. Safety

	<p>NOTE</p> <p>Please note the operation manual carefully, before using the device! Strictly observe the Installation instructions! In case of damage caused by failure to observe these operating instructions, the warranty expires.</p> <p>ELGO Electronic GmbH & Co. KG and its subsidiaries are not liable for any damage to persons, property or assets caused by defective material on the device and / or its associated components. We assure no liability for consequential damage!</p> <p>The operator is obliged to take safety measures and implement.</p> <p>The Commissioning may only be performed by personnel that has been authorized and trained by the operator.</p>
---	--

2.1. General Cause of Risks

This chapter gives an overview about all important safety aspects to guarantee optimum protection of employees and a trouble-free operation.

Non-observance of the instructions given in this operation manual can result in hazardous situations.




2.2. Personal Protective Equipment

Employees must wear protective clothing during installation of the device to minimize the risk of accidents.

Therefore:

Change the indicated wear protective clothing before beginning the work process and wear while working any signs observe any labels in the operating area regarding protective clothing.

Protective clothing:

	<p>Safety working clothing</p> <p>... are clothes that tears easily, with tight sleeves with no parts sticking out Also wear no rings, necklaces or other jewellery.</p>
	<p>Protective gloves</p> <p>... for protecting the hands against abrasion or other superficial skin injuries.</p>
	<p>SAFETY HELMET</p> <p>...for protection of head injuries.</p>

2.3. Intended Use

The device is only for the limited purpose as described in this manual:

The P40 ELGO position controller is designed exclusively for controlling positions.



WARNING!

Danger through non-intended use!

Applications exceeding the intended use and non-intended use of the device can lead to dangerous situations.

Therefore:

- Use **P40** only as intended
- Strictly follow this manual

Avoid in particular these uses. They are regarded as non-intended.

Remodelling, refitting or changing of the device or parts of it with the intention or usability the device of changing the range of application.

ELGO is not liable for any damages or the device resulting from non-intended use of the product. The operator of the device is liable for all damages during non-intended use.

3. Transport and Storage

3.1. Safety hints for Transport, Unpacking and Loading

**CAUTION!**

Professional transport only.
Do not throw, the package, avoid shock, handle with care.

3.2. Handling of Packaging Material

For information on proper refer to chapter.

3.3. Check of Transport

Check delivered goods upon receipt for completeness and transport damage.

In case of externally recognizable transport damage:

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

**NOTE!**

Report any damage, as soon as it is discovered for damages must be filed within the applicable claim periods.

3.4. Storage

Store device only under 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: 10 to + 60 °C (see technical data, chapter 6)
- Relative humidity: 80 % non-condensing (see technical data, chapter 6)
- Inspect packages regularly if stored for an extensive period of time (> 3 months)
- If stored for more than 3 months regularly inspect the condition of all parts and of the packaging.

4. Product Features

Main features:

- Analog or digital outputs for 1 - 3 speed operation
- 16 freely programmable digital in-/outputs
- Program memory (1000 sets)
- Angle control / gap control / backgauge
- Limitation of the cutting length possible through measurement system and time
- List of materials for angle and gap control
- Voltage output depending on material



The controllers of the **P40** series are suitable for simple positioning tasks. An important feature is the simple and user-friendly keyboard. It allows for a quick and comfortable setting of the target value, if necessary a specific quantity of desired pieces, an angle or the gap. Target and actual value of the axes plus quantity will be displayed on the front panel.

Via a second encoder input, the cutting angle or gap can be displayed and controlled. These encoder inputs work in an analog mode. A back stop can be programmed.

The **P40** series has an internal program memory with up to 1000 lines. For the positioning two different kinds of output signals are available: Switch mode positioning and PID-analog output.

Basic modes of operation:

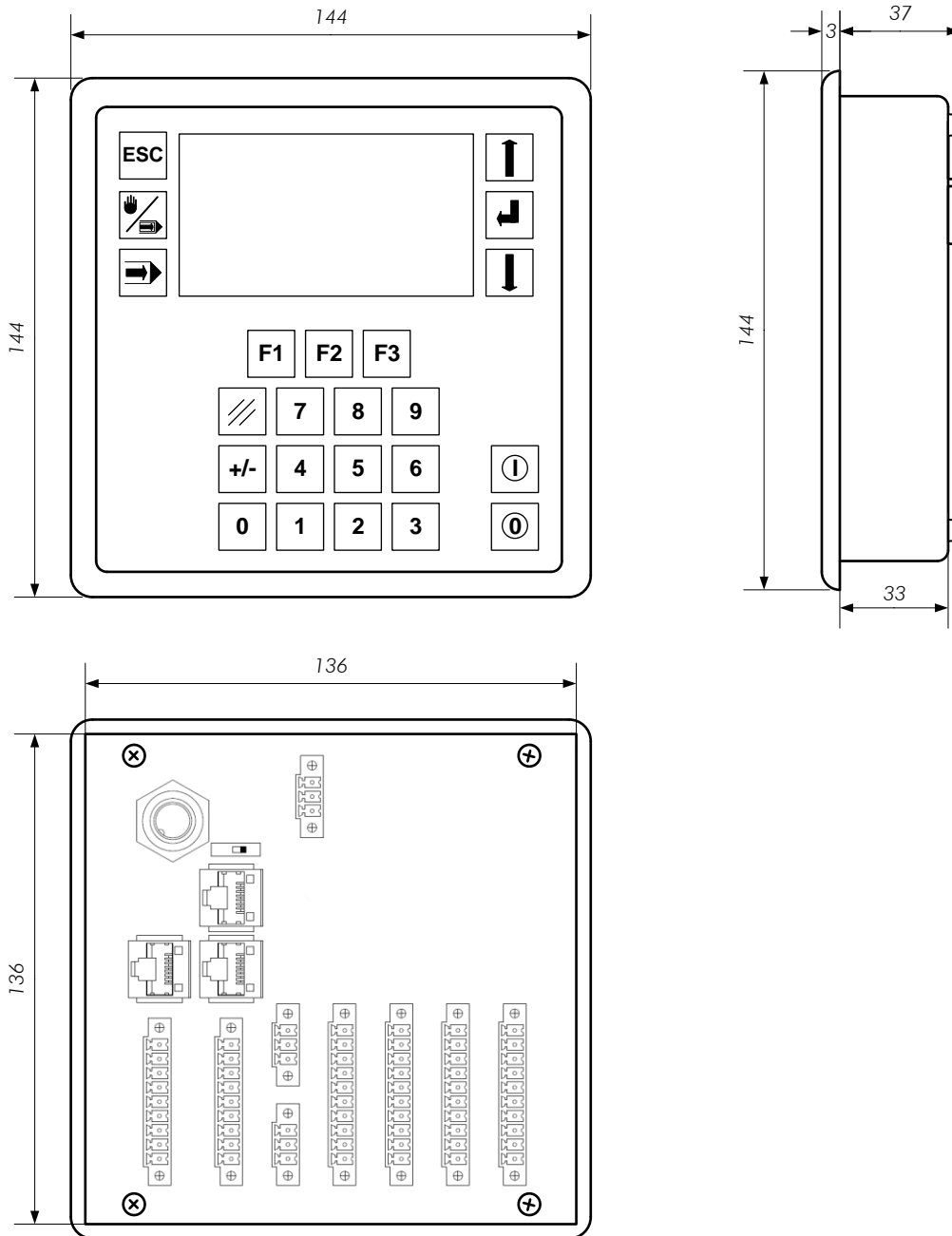
The **P40** consists of three basic operation modes:

1. Manual: Inching operation moves the axes through the keypad.
2. Single: A single set can be worked off.
3. Program: In this operation mode, data sets can be programmed and worked off one after the other. In this case, the program consists of several separate data sets.

5. Technical Data

Input supply voltage	24 VDC
Power input	24 VDC; max. 150 mA (no-load condition)
Rotary encoder supply	24 VDC or 5VDC ; max. 130 mA
Analog input (option)	12 Bit resolution ; 3,3 V supply for measuring system
Input signals	The pin assignment of the inputs and the input logic are programmable Minimum pulse duration: 300 ms Input current /pin: max. 10 mA
Output signals	The pin assignment of the outputs and the output logic are programmable Open Emitter (PNP) Completely short-circuit-proof Output current: max. 80 mA Recovery diode is integrated
Actual value memory	E ² Prom Durability: 10 ⁵ On-Off-Switch-Cycle or 10 years
Connection technology	Phoenix Connectors
Displays	LCD Dot-Matrix 128 x 80 mm with white backlight
Hardware	32-Bit-Microprocessor with 1 MByte Flash and 56 Kbyte RAM
System accuracy	+/- 1 increment
Input frequency	100 KHz (upgrade possible on request) equals 120 m/min. (2 m/s) at 0,1 mm resolution
Housing dimensions	W x H x D = 144 mm x 144 mm x 40 mm (without connector)
Cut out	W x H = 136 mm x 136 mm
Installation depth without connector	40 mm
Installation depth with connector	75 mm
Ambient temperature	0 to +45 °C

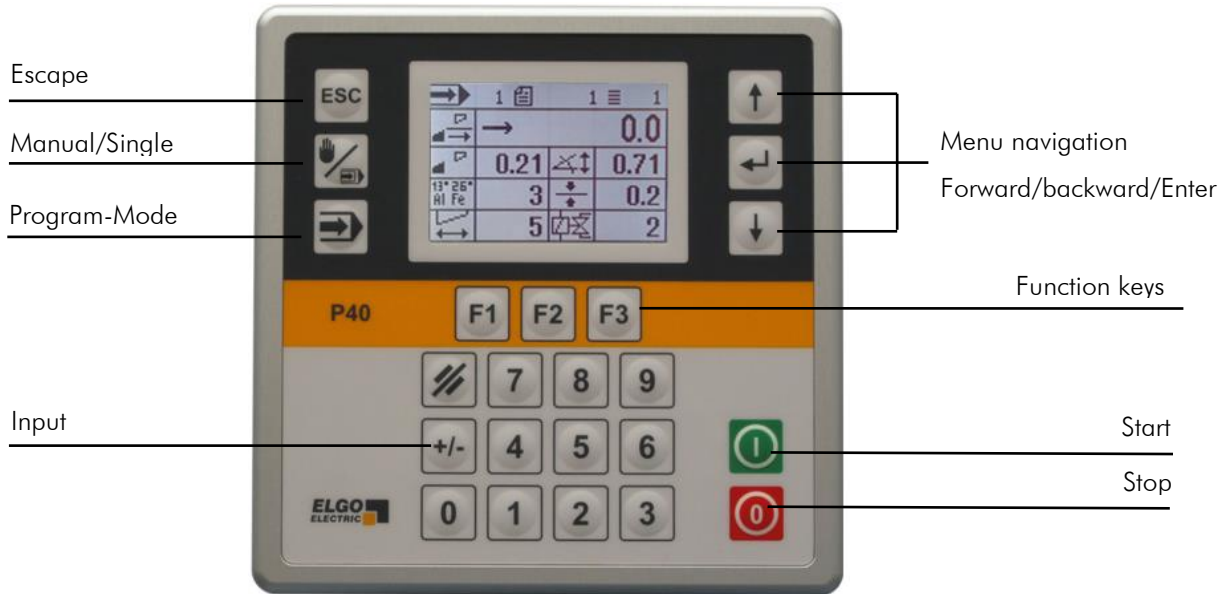
5.1. Dimensions



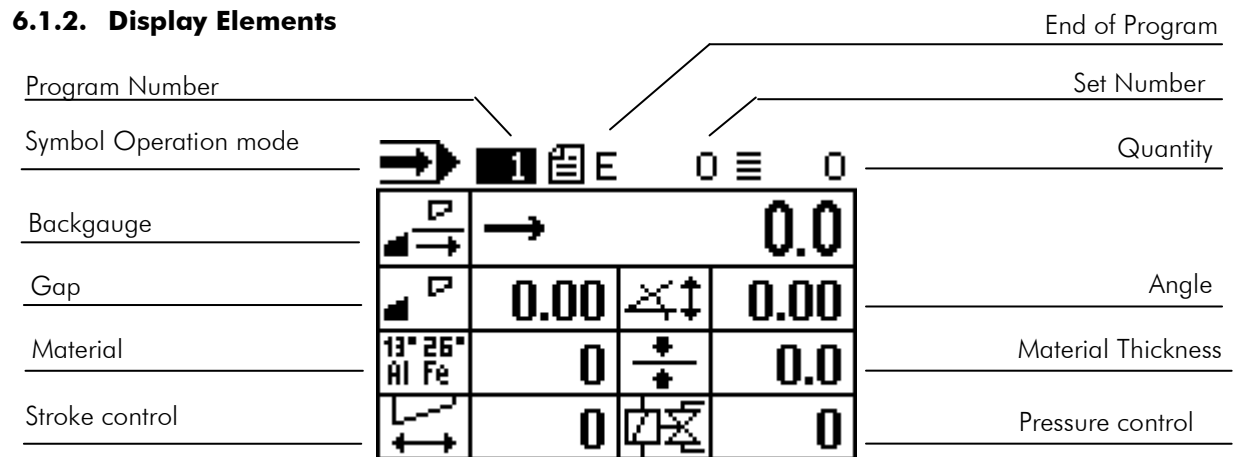
6. Configuration and Functions

6.1. Elements

6.1.1. Control Elements















6.1.2. Display Elements



Note!
The display elements can differ depending on operation mode and configuration.

6.1.3. Function of Keys

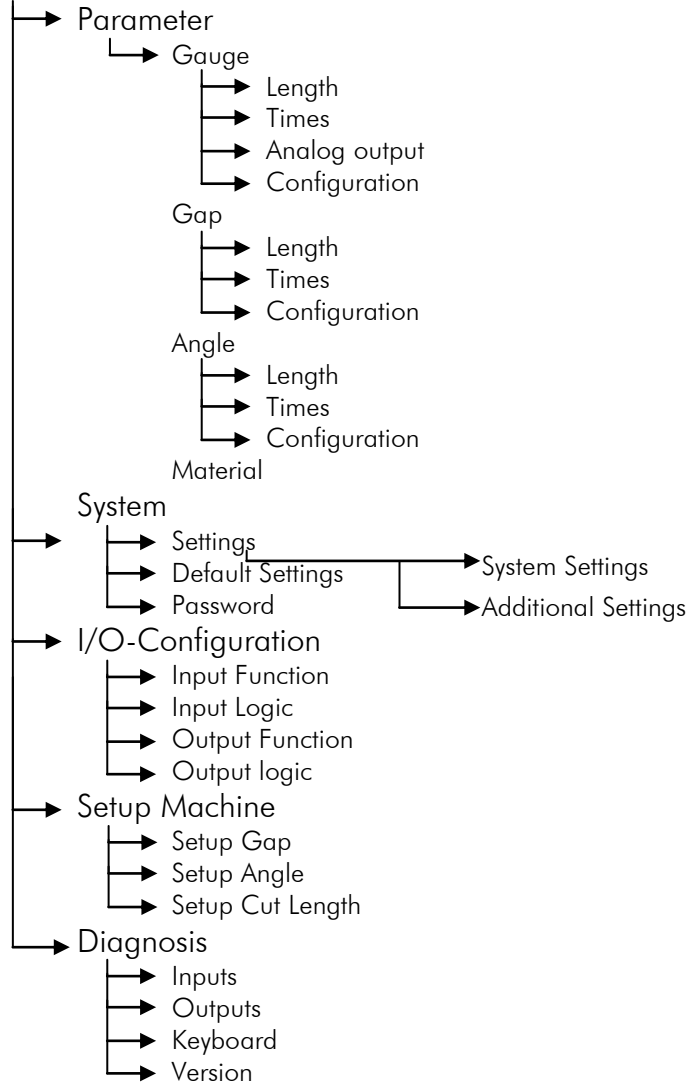
	Change operation mode between „Manual“ and „Single“
	Operation mode "Program"
	Leaving an operation mode or a sub menu
	Select or confirm
	Cursor navigation „up“
	Cursor navigation „down“
	Function keys (depending on menu or operation mode)
	Clear or reset an input
	Change of sign
	Enter target value or parameter value
	Start positioning
	Stop positioning

6.2. Menus, sections and parameters

Operation Modes

- Manual Mode
- Single Mode
- Program Mode

Service



6.2.1. Axis Menu / Length

Relevant distances for the axes can be set in this menu.

Axis Length

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

Axis times

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

Axis analog output

Access to parameters concerning the analog output.

Configuration Axes

Access to general parameters concerning the axes.

- Slow forward
- Creep forward
- Correction stop forward
- Slow backward
- Creep backward
- Correction stop backward
- Tolerance window
- Manipulation window
- Loop length
- Forced loop window
- Reference value
- Retract length
- Limit MIN
- Limit MAX
- Factor

6.2.2. Axis Menu Length Parameters

Slow speed (fwd)/slow speed (rev) = middle speed

Distance to the target position at which the controller switches from high speed to slow speed.

Creep speed (fwd)/creep speed (rev) = slow speed

Distance to the target position at which the controller switches from slow speed to creep speed.

Correction stop (fwd)/correction stop (rev)

The overrun distance can be programmed to compensate for distance from the switch-off point of the motor to standstill.

Example:

The demand position is constantly overrun by 0.2 mm. The data entry has to be 0.2mm.

The stop command is then moved forward by 0.2 mm.

When starting to operate the machine, the correction stop is set to "0" in order to be able to calibrate the overrun accurately. For an exact positioning, the correction stop should be as small as possible (0.0 to 0.2 mm) i.e. the mechanical friction should be constant over the entire retract distance and the slow speed and/or creep speed must be set low accordingly.



NOTE!

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

Example: Positioning with one speed

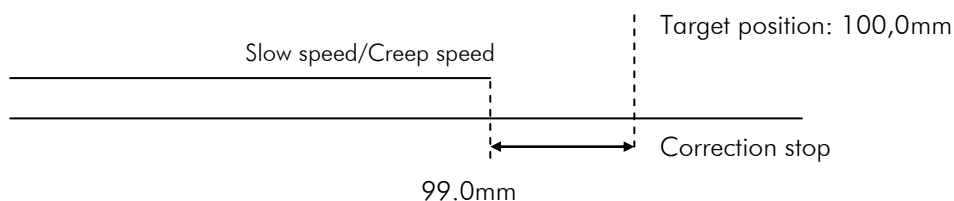
When setting the parameters, the speeds have to be set as follows:

Slow speed = Creep speed = Correction stop

Slow speed: 1,0 mm

Creep speed: 1,0 mm

Correction: 1,0 mm

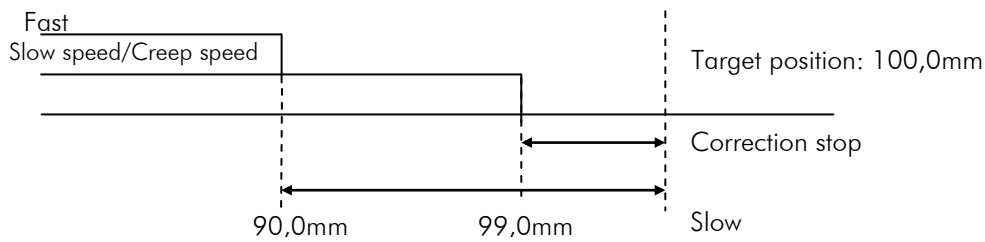


Example: Positioning with two speeds

When setting the parameters, the speeds have to be set as follows:

Slow speed = Creep speed > Correction stop

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

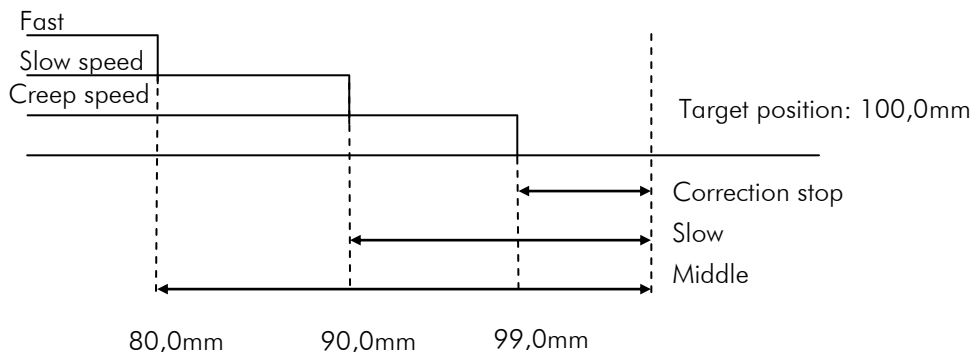


Example: Positioning with three speeds

When setting the parameters, the speeds have to be set as follows:

Slow speed > Creep speed > Correction stop

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



Tolerance window

Within this window, the signal "position reached" is generated.

Manipulation window

It is possible to enter a value in this register that represents an acceptable tolerance. When the actual position is within the tolerance, the actual position displayed is aligned with the target position.

The entered range of tolerance is always active in the + and – range around the target value. The real actual value is saved in the processor, i.e. no positioning errors through adding up occur.

Example:

Entered value = 0.2 (tolerance +/- 0.2 mm)

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



NOTE!

The manipulation window should be set to zero before starting to operate.

Loop length

In order to compensate spindle tolerances, the target position must be approached always from the same direction. That means that in one direction the demand position will be overrun by the entered value. After expiration of the time that was entered in the menu/times/loop length, the target position will be reached again.

Forced loop window

When using absolute positioning, a loop is driven if the value is within the + and – range around the value of the "forced loop window".

Reference value

A reference value or a reference position can be entered.

Retract length

When activating the retract input, the axis moves to this value or by this value, according to the retract mode (see page 29).

Limit MIN/MAX

These two values can be used if no mechanical limit switches are present or in addition to already existing mechanical limit switches.

End position min.: This value should be between the smallest length/position that has to be worked off and zero (or shortly before the mechanical limit switch).

End position max.: This value should be between the largest length/position that has to be worked off and the maximum length (or shortly before the mechanical limit switch).

Factor

Here the factor for evaluating the pulses (when measuring in cm) is set:

Example: rotary encoder = $1000 \frac{[\text{pulses}]}{[\text{RPM}]}$

Spindle distance = $100 \frac{[\text{mm}]}{[\text{RPM}]}$

$$\text{Factor} = \frac{\text{Spindle distance [mm]}}{\text{pulses}} = \frac{100[\text{mm}]}{1000[\text{pulses}]} = 0,1 \frac{[\text{mm}]}{[\text{pulse}]}$$

6.2.3. Axis menu / times

The times relevant for the respective axes can be entered from 0.1 to 99.9 seconds.

Axis length

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

Axis times

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

Axis analog output

Access to parameters concerning the analog output.

Configuration Axes

Access to general parameters concerning the axes.

Position reached

Loop length

Delay manual fast

Monitoring

Delay control start

Delay control inpos.

Delay start

Position control

Delay retract

Delay reference

6.2.4. Parameters of time

Position reached

The signal is based on a variable time when a time value is set or statically/maintained (axis in position) if the value is set to 0.

The appropriate output signal becomes active if:

Actual value = demand value +/- stop offset

Loop length

In the peak of the loop drive, the drive signals drop out. The controller returns to the target value only when the parameterized time expires (adjustment range 0.1 sec - to 99.9 sec).

Delay manual fast

Here the time in manual mode can be entered to set the speed from the low speed to the next higher speed.

Monitoring

For encoder monitoring a time can be entered (0.1... 99.9 seconds). If for the entered time no more pulses are detected at the controller in order to stop the engine, the operating signals are switched off.

Delay control start

After the start command the output "closed loop inhibit" is activated. After reaching the target position and only after the operational sequence (0.1 ... 99.9 sec) in register "time delay for drive inhibit" is worked off the output is set back.

Delay control inpos.

After having reached the position, the signal "position reached is only generated after the amount of time entered here.

Delay start

After the command "start", the positioning is delayed by this amount of time.

Position control

Here the time in 0.1 sec. can be entered for shutdown after the position is reached.

Retract

Here the time in 0.1 sec. can be entered for return from the peak of the retract to the target value.

Delay reference

In the peak of the reference run, the drive signals drop out. The controller will only continue positioning when this time expires (adjustment range 0.1 sec - to 99.9 sec).

6.2.5. Axis menu / analog output

The axis relevant analog parameters can be set in this menu.

Axis length

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

Axis times

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

Axis analog output

Access to parameters concerning the analog output.

Configuration Axes

Access to general parameters concerning the axes.

Velocity

Acceleration

P-value

I-value

D-value

I-limit

Resolution encoder

Stop mode common

Stop mode manual

Start mode

v manual fast

v manual slow

v Reference mode 1

v Reference mode 2

U fast forward

U middle forward

U slow forward

U fast backward

U middle backward

U slow backward



Notice!

The parameters for analog mode are only necessary for devices with option PID.

6.2.6. Analog output parameters

Velocity

The maximum speed for positioning is set in this register, in rpm. The speed is monitored by the encoder speed (0 – 10000 rpm). Should there be gearing between the motor and the encoder this has to be considered in the calculations.



EXAMPLE!

Demanded motor speed rpm = 3000

Gearing ratio $i = 10$

$$V = \text{RPM}/i = 3000/10 = 300$$

Acceleration

The acceleration during positioning in revolutions per second squared is set in this parameter.

P-value

Proportional amplification: setting 1.....3000

General:

The P-controller exclusively consists of a proportional portion and therefore is amplifying. In principle the P portion multiplies the input value by a constant factor.

P40:

By offset the difference between the demand and actual value is multiplied by 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-value / I-Limit

Integral portion: setting 1....1000

General:

An I-controller (integrating controller) provides 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 by 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:

By offset the analog control voltage will continue to increase step by step until there is zero difference between demand and actual position or the entered I-limit in this register is reached. The greater the I-portion, the slower is the response.

D-value

Differential voltage: setting 1...1000

General:

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

P40: By 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).

Resolution encoder

Rotary encoder resolution:

The encoder pulses per revolution are entered in this register. This enables the calculation of speed to be effected (max. 10 000 ppr).

Stop mode common

For the different possibilities to stop the system the P40 comes with this special register.

- 2 = Stop smoothly (Stop ramp = negative acceleration)
- 1 = Stop abrupt (Stop ramp = highest possible negative acceleration)
- 0 = Stop turn off motor (Analog signal is set to zero)

Stop mode manual

For the different possibilities to stop the system the P40 comes with this special register also in manual mode.

- 2 = Stop smoothly (Stop ramp = negative acceleration)
- 1 = Stop abrupt (Stop ramp = highest possible negative acceleration)
- 0 = Stop turn off motor (Analog signal is set to zero)

Start mode

- 0 = If the axis is within the tolerance window, it is not started again
- 1 = The Der Start der Achse wird in der Toleranzzone erzwungen

v Manual fast

Here the fast speed can be set for moving the axes in manual mode.

v Manual slow

Here the slow speed can be set for moving the axes in manual mode.

v Reference mode 1

Here the reference run speed of the back gauge until reaching the initiator is defined.

v Reference mode 2

Here the reference run speed of the back gauge until reaching the index pulse is defined.

U fast forward

Voltage for fast speed forward

U middle forward

Voltage for middle speed forward

U slow forward

Voltage for creep speed forward

U fast backward

Voltage for fast speed backward

U middle backward

Voltage for middle speed backward

U slow backward

Voltage for creep speed backward

6.2.7. Axis menu / Configuration

System relevant general parameters can be entered in this register.

Axis length

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

Axis times

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

Axis analog output

Access to parameters concerning the analog output.

Configuration Axes

Access to general parameters concerning the axes.

Axis type

Decimal point

MM/Inch Modus

Direction mode manual

Relay configuration

Reference mode

Loop mode

Software limit mode

Hardware limit mode

Retract mode

inc error compensation

6.2.8. System parameters

Axis type

The type of axis is defined in this parameter.

- Axis deactivated
- Microcontroller
- PID Controller
- Analog potentiometer

Decimal point

Decimal point: Here you can specify the number of decimal places.

MM/Inch mode

Selections of the mm / inch. Parameters are not automatically calculated to avoid rounding errors.

Direction mode manual

The allocation of the direction for the corresponding keys can be set as inverted in this parameter.

- normal
- inverted

Relay configuration

With configuration of the motor signals, different starting combinations for the different speeds can be set.

- Drive signals = Mode 1

3 speeds (ELGO-standard)

Speed = output signals 1-3 ascending

Output 4 sets direction reverse

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

- Drive signals = Mode 2

2 speeds

Independent outputs forwards and reverse

Independent outputs fast and slow

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

Creep speed backward		X		X
Slow speed backward				
Fast speed backward			X	X

- Drive signals = Mode 3

2 speeds

speed = output signals 2 + 3

output 4 set direction reverse

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

- Drive signals = Mode 4

2 speeds

Independent outputs for direction and speed

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

- Drive signals = Mode 5

3 speeds

Speed forward = output signals 1-3 ascending

Speed backward = always fast

output 4 sets direction reverse

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

- Drive signals = Mode 7

3 speed

Forward/backward separately

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

- Drive signals = Mode 8

2 speeds

Forward/backward separately

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

Reference mode

The mode for referencing is defined in this parameter.

Mode 1 = Calibration through reference parameter

Mode 2 = Calibration through demand value

Mode 3 = Reference run positive with index impulse

Mode 4 = Reference run negative with index impulse

Mode 5 = Reference run positive to input "reference point"

Mode 6 = Reference run negative to input "reference point"

Loop mode

The different types of backlash compensation (loop) are defined in this parameter.

- Mode 1 = No spindle compensation
- Mode 2 = Negative spindle compensation
- Mode 3 = Positive spindle compensation
- Mode 4 = With backlash by positioning in negative direction
- Mode 5 = With backlash by positioning in positive direction

Software limit mode

- All end positions activated
- End position min deactivated
- End position max deactivated
- All end positions deactivated

Hardware limit mode

- All end positions activated
- End position min (defined input) deactivated
- End position max (defined input) deactivated
- All end positions deactivated

Retract mode

Mode 1 = Descent/retract to actual value + adjusted value*

Mode 2 = Descent/retract to adjusted value*

Mode 3 = Descent/retract positive to actual value for the adjusted time period**

Mode 4 = Descent/retract to actual value + adjusted value* without return

Mode 5 = Descent/retract to adjusted value* without return

Mode 6 = Descent/retract positive to actual value for the adjusted time period** without return

Mode 7 = Descent/retract to actual value – adjusted value*

Mode 8 = Descent/retract negative to actual value for the adjusted time period**

Mode 9 = Descent/retract to actual value – adjusted value* without return

Mode 10 = Descent/retract negative to actual value for the adjusted time period** without return

* see parameter descent/retract distance

** see parameter time descent

inc error compensation

If activated the controller compensates for errors that may add up doing a lot of drives.

- active
- not active

6.2.9. Material Table

In this table the material specific experienced values for cut angle and gut gap can be entered in this parameter. The more inputs are made the more precise the non-existing values in the table can be calculated through interpolation. By operating one set or more sets the only values that have to be entered are the kind of material (material no.) and the metal sheet thickness.

The buttons F1 and F3 are used to scroll through the material table. The button F2 is used for switching with the cursor from one column to another column. The values have to be higher than zero in both columns. If the value is zero the relevant line will be detected as the end of the material table. As a result of this all subsequent values won't be recalled.



Note!

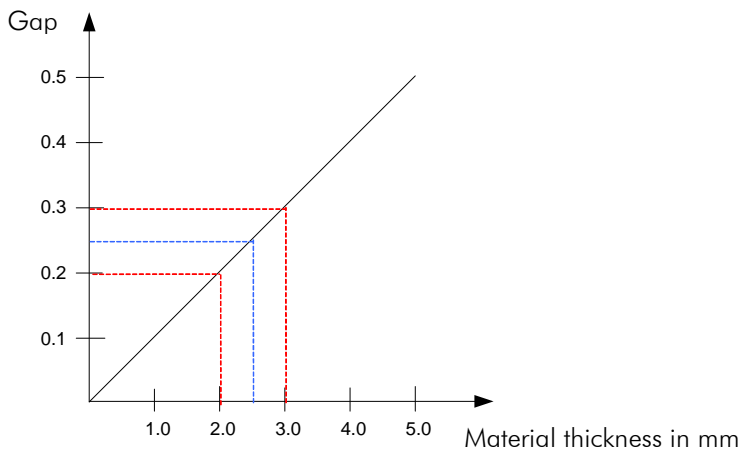
The values have to be higher than zero in both columns.

6.2.10. Explanation of the Interpolation

Because of that it is possible to deposit only values in 1 mm sequences, the values between this sequences will be interpolated. The calculation of the intermediate steps take as a basis of two sequenced material thicknesses for the action of the values of gap and angle.

Example: The red marked values are firmly rooted in the material table. Now a value for the material thickness of 2.5 mm will be loaded. For the clarity in this example, only the calculation of the value of the gap is illustrated. The calculation of the intermediate steps for the angle according to the same principle.

Thickness	Gap	Angle
1	0.10	0.75
2	0.20	1.00
3	0.30	1.25
4	0.40	1.50
5	0.50	1.75
...



6.2.11. Menu / System

Settings

Access to system parameters.

Default Settings

Reset to factory parameters

Password

Enter the Password

System Settings

- Language
- Axis enable
- Counting mode single
- Time quant. end single
- Counting mode program
- Time quant. end program
- Number of programs
- Next step mode
- Edit mode timeout
- Cut length mode
- Pressure control

Additional Settings

- Blade length
- Cut time
- Offset cut time
- U at 100% pressure
- Position (%) adjust angle

6.2.12. System Settings

Language

- German
- Italian
- Chinese
- English

Axis enable

- All axis
- Gauge + gap
- Gauge + angle
- Gauge only

Counting mode single

- Without counter
- Automatically subtracting
- Automatically adding

Time quant. end single

- 0 / 1 / 2 / 3 / sec.

Counting mode program

- automatically subtracting
- automatically adding

Time quant. end program

- 0 / 1 / 2 / 3 / sec.

Number of programs

- 1
- 2
- 5
- 10
- 20
- 25
- 40
- 50

Next step mode

- Mode1: Not active
- Mode 2: After set without start
- Mode 3: After set with start

Edit mode timeout

1/2/3/4/5 sec.

Cut length mode

- Off
- Over axis angle
- over Time

Pressure Control

- On/Off

6.2.13. Additional Settings**Blade length**

- Length of blade in mm.

Cut time

- Average time from the beginning to the end of the cut, which the knife needs for cutting.

Offset cut time

- Time of the upper rest position to commence, which the knife needs to reduce.

U at 100% pressure

Voltage at 100% pressure (max. 10V DC)

Position (%) adjust angle

Pressure for adjusting angle

6.3. Machine setting

6.3.1. Gap Setup (Cut gap)

Minimum gap:

Enter the small cut gap of the shear (e.g. 0.5 mm) and after that drive manually to the smallest position by using **F1-key** or **F3-key**. When reached this position press the **F2-key** (teach). The incremental measurement value is assigned to the gap and entered in the field "min." is saved.

Maximum gap:

Enter the large cut gap of the shear (e.g. 10.0 mm) and after that drive manually to the largest position by using **F1-key** or **F3-key**. When reached this position press the **F2-key** (teach). The incremental measurement value is assigned to the gap and entered in the field „max.“ is saved.

6.3.2. Angle Setup (cut angle)

Minimum angle:

Enter the small possible cut angle of the knife bar (e.g. 0.0°) and then drive manually to the smallest position by using F1-key or F3-key. When reached this position press the F2-key (teach). The incremental measurement value is assigned to the angle and entered in the field "min." is saved.

Maximum angle:

Enter the large possible cut angle of the knife bar (e.g. 10.0°) and then drive manually to the largest position by using F1-key or F3-key. When reached this position press the F2-key (teach). The incremental measurement value is assigned to the angle and entered in the field „max value“ is saved.

6.3.3. Cutting length Setup

If the same analog measuring system which is used for the angle also used for the angle Cutting length, then it is necessary, set the values for the cutting length calculation.

Setting values with minimum angle:

Place the cursor in the first row and first column of the table (line: min; column: S. Beg).

Now, enter the smallest possible cut angle. Let down the cutting blade to beginning of the cut (till the point, where the upper beam and lower beam of the scissors just touch) and press the F2 key.

Now place the cursor on the field in the first row and second column (row: Min; column: S. End) and let down the cutting blade to the end of the cut. Now press the F2 key again. Thus the values for the minimum angle are set up.

Setting values with maximum angle:

Place the cursor in the second row and second column of the table (line: max; column: S. Beg).

Now, enter the biggest possible cut angle. Let down the cutting blade to beginning of the cut (till the point, where the upper beam and lower beam of the scissors just touch) and press the F2 key.

Now place the cursor on the field in the first row and second column (row: Max; column: S. End) and let down the cutting blade to the end of the cut. Now press the F2 key again. Thus the values for the maximum angle are set up.

6.4. Configuration of inputs and outputs

With the controller P40 it is possible to configure freely the inputs and outputs with their associated logic.

6.4.1. Link-up the inputs with functions

In the menu "Input functions" you will find an overview of all functions of the inputs which can be assigned. After dialing a function by using the navigation buttons you can select this function by pressing the Enter key. If a previously used input is needed to be reset, you can use the "delete key" to dial it in the "not used" state. If an output is already set with a function, then automatically only the next free output is selectable.

6.4.2. Allocation to the logic input functions

If you are as specified in section 6.4.1 the inputs of the controller with functions, then you can use this menu to define whether the corresponding input function to a logical "High" - level or at a logical "low". Assigning the logic takes place by pressing the enter key.

6.4.3. Linking the outputs of functions

In the menu "Output functions" you will find an overview of all functions of the outputs which can be assigned. After dialing a function by using the navigation buttons you can select this function by pressing the Enter key. If a previously used output is needed to be reset, you can use the "delete key" to dial it in the "not used" state. A repeated Assign of the outputs is not possible here and is from the outset of the software prevented. If an output is already set with a function, then automatically only the next free output is selectable.



NOTE!

Outputs can not be assigned several times.

6.4.4. Logic Allocation to Outputs

At the outputs it is also possible depending on the selected output function to assign a logic. The set follows the same procedure as in Section

7. Operation

7.1. Operation Modes

7.1.1. Manual mode

With the keys F1 & F3 the axis shown in the display can be driven manually or with the inching function.

In register "delay hand" a time (in sec) can be set. If the hand mode is selected and the entered time value is worked off the manual mode will automatically switch from creep speed to fast speed.

7.1.2. Single mode

In single mode, it is possible to process a single unit. Use the arrow keys to navigate to the corresponding axis. If a desired item is edited, the cursor starts to blink. Each input target position must be confirmed with the Enter key. If the entry is complete, the cursor stops flashing. The new value was taken. In single operation it is also possible to set position for the axis angle and crevice of a material table to load out. See at the bottom of the menu box of material "and a field strength of material. After changing one of the fields and the new value has been confirmed that the target positions for axle clearance and axis angle are shown. It is also possible to assign a value for the average length of demarcation. For this purpose, see the relevant chapter.

7.1.3. Program mode

Using the program mode up to 1000 individual programs can be programmed and individually driven. All positions are successively driven. This process must be started once using the start command.

Input of a program

Starting the program mode will open an input window in which the desired program number can be entered. After this operation the "Enter key" has to be pressed to open the program window.

At first start the user has to enter a memory block number.

Entering the memory block number is only necessary if the user is in the first data set of the program is. To ensure faster entry in all other data sets only the following elements have to be changed:

- Target value Backgauge
- Position mode
- Set Number
- Quantity
- Cutting length

If you are in input mode then the cursor is blinking. To end the entry you have to press the enter key to confirm. The last entered value will be immediately saved. The buttons F1 and F3 are used to navigate through the individual program sets. Also it is possible to select the set number with the cursor and adjust the corresponding set number. Also it is possible to load material values out of the material table for Angle and Gap with select the kind of material. More detailed information about material table you can see in the corresponding chapter. If all elements edited you have to select the menu element "Set number" by using the cursor and then press the button F2. This will end the program in the last row and the last set will be marked with the letter 'E'.

Handle of a program

The program mode can be select directly by using the program button. First, choose a program by entering a program number, and confirmed with the Enter key. With the keys F1 and F3 you can scroll again through all the sets. The automatic positioning starts by pressing the Start button. Now, all sets will be processed until the end marker of the program is reached. The positioning process can be intercepted by pressing the stop button at any time. The program remains in the current set. To restart the program, press the start button again.

7.1.4. Reference

The following parameter settings can be selected in the menu
Parameters -> axes -> General Axes Parameter -> Mode reference

Mode 1: "parameters":

If this is selected and the external reference input is active or F2 - button will be pressed for more than two seconds, then the stored value from the menu **Parameters->Axes->Distances->Reference value** will be brought in the actual value window for this axis.

Mode 2: "over target value":

If this is selected and the external reference input is active or F2 - button will be pressed for more than two seconds, then the entered value from target position will brought in the actual value window for this axis.

Mode 3: "positive drive":

To limit switch with index pulse

Mode 4: "negative drive":

To limit switch with index pulse

Mode 5: "positive drive":

Only end switch without index pulse

Mode 6: "negative drive":

Only end switch without index pulse

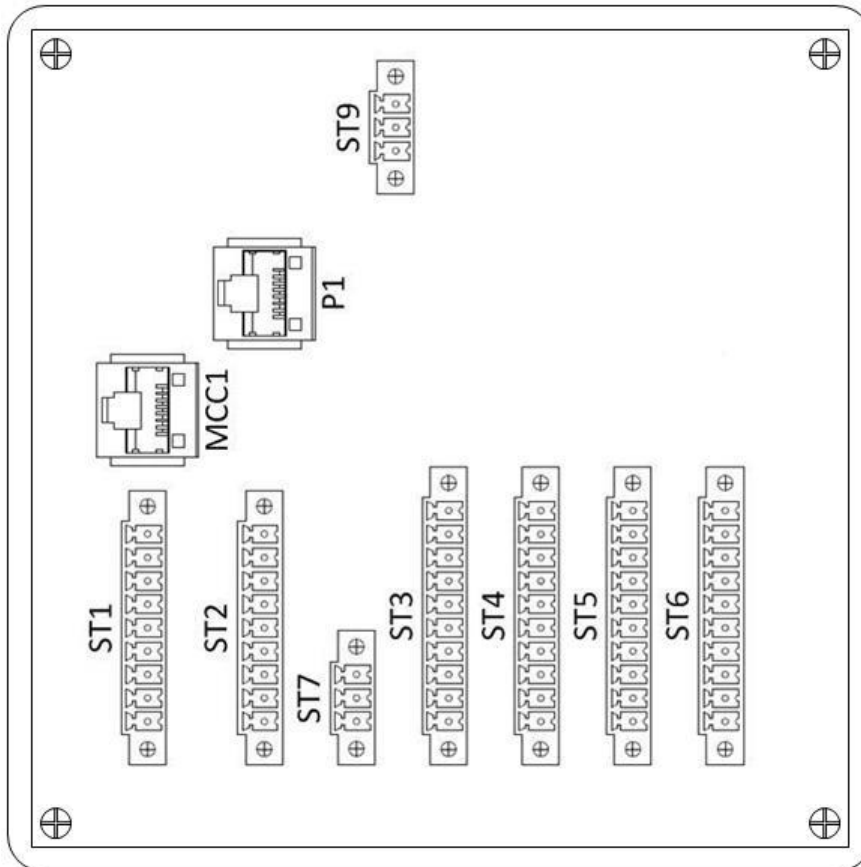
Function of reference drive

The reference run will be started by holding the button F2 for more than 2 seconds. A "start reference run" by using the external input for reference is not possible. The controller now proceeds to referencing the axis in dependence of the parameter: **Parameter -> Axes -> General -> Mode reference**.

The output "reference drive run" is set.

If the appropriate input (limit switch positive or negative) is activated, the controller stops. After a dwell time the controller position in the opposite direction. Once the appropriate input (limit switch) is disabled, the input "zero pulse" will be released. For the next zero pulse the controller stops and the value of the register **Axes -> Reference** will be transferred in the actual value window.

7.2. Connector pin assignment



ST1	=	Encoder input Backgauge
ST2	=	Encoder input Angle and Gap
ST3/ST4	=	Digital Inputs
ST5/ST6	=	Digital Outputs
ST7	=	Analog Output (PID)
ST9	=	Power supply
MCC1	=	Analog Output/Motor Drive Controller (MCC)
P1	=	PC Interface



Note!

The Analog Output is only available for devices with Option PID.

7.2.1. Overview Terminal Assignment



DEFAULT SETTING / STANDARD ASSIGNMENTS: The pin assignments for inputs and outputs shown below correspond to the ELGO standard configuration as delivered. In the standard configuration, not all inputs and outputs (available in the parameter level) are activated. During connection individual adaptations of the terminal assignment or the activation of additional inputs and/or outputs must be taken into account separately.

ST1 Encoder Backgauge	
1	GND
2	5 VDC / 24 VDC
3	A-Channel
4	B-Channel
5	Earth
6	/A-Channel
7	/B-Channel
8	Z-Channel (Index pulse)
9	/Z- Channel (Index pulse)

ST2 Encoder Gap and Angle	
1	GND
2	3.3 VDC Supply
3	Analog Input Gap 0 ... 3.3 VDC
4	
5	Earth
6	
7	
8	
9	Analog Input Angle 0 ... 3.3 VDC

ST3 Inputs	
1	GND
2	24VDC (Output)
3	Limit Switch Min. Axis 1
4	Limit Switch Min. Axis 2
5	Limit Switch Min. Axis 3
6	Limit Switch Max. Axis 1
7	Limit Switch Max. Axis 2
8	Limit Switch Max. Axis 3
9	
10	

ST4 Inputs	
1	GND
2	24VDC (Output)
3	Stop Positioning
4	Start Positioning
5	Retract Axis 1
6	Reference Axis 1
7	Counter (add. / subtr.)
8	
9	
10	

ST5 Outputs	
1	GND
2	+24 VDC (Output)
3	Drive Signal 1 Axis 1
4	Drive Signal 2 Axis 1
5	Drive Signal 3 Axis 1
6	Drive Signal 4 Axis 1
7	Drive Signal 1 Axis 2
8	Drive Signal 2 Axis 2
9	Drive Signal 1 Axis 3
10	Drive Signal 2 Axis 3

ST6 Outputs	
1	GND
2	24 VDC (Output)
3	Controller Enable Axis 1
4	Reference Drive Run Axis 1
5	Quantity reached
6	Cutting Enable
7	Cutting Length reached
8	
9	
10	

ST7 Analog Output (PID)	
1	GND
2	Analog-target Value +/- 10 VDC
3	Earth

ST9 Supply	
1	GND
2	24VDC
3	Earth

MCC1 Analog Output/Motor Controller MCC	
1	Controller Enable
2	
3	A-Channel
4	B-Channel
5	/A-Channel
6	/B-Channel
7	Analog-target Value +/- 10 VDC
8	GND

P1 PC-Interface	
1	GND
2	RS232 RX
3	RS232 TX
4	CAN L (Option)
5	CAN H (Option)
6	MD0 (Special)
7	MD1 (Special)
8	MD2 (Special)

Error Codes

error 01: min hardware limit axis 1 active
error 02: min hardware limit axis 2 active
error 03: min hardware limit axis 3 active
error 04: max hardware limit axis 1 active
error 05: max hardware limit axis 2 active
error 06: max hardware limit axis 3 active
error 07: min software limit axis 1 active
error 08: min software limit axis 2 active
error 09: min software limit axis 3 active
error 10: max software limit axis 1 active
error 11: max software limit axis 2 active
error 12: max software limit axis 3 active
error 13: error measuring system axis 1
error 14: error measuring system axis 2
error 15: error measuring system axis 3
error 16: external stop active
error 17: wrong material thickness, look up table

7.2.2. Description of Inputs**Min / max hw. limit**

If one of the hardware limit switches is active, the corresponding error (01-06) is activated.

Retract

If this input is active, the axis will move depending on selected retract mode.

Reference start

If this input is active, the reference run is executed or calibrated depending on selected reference mode.

Reference point

Needed for reference run (mode 5 & 6).

Extern Stop

If activated, the positioning is stopped. Starting the positioning is not possible as long as this input is activated.

Extern Start

If activated, the positioning is started. The function is identical to the START button

Quantity

A rising flank triggers the pieces counter.

Next program step

If activated, the controller switches to the next program step.

Cut in process

If activated, tells the controller that the top dead center of the knife bar has been left → cutting is in process.

7.2.3. Description of Outputs

Drive signals

The drive signals are different depending on the selected mode in parameter/angle/configuration and parameter/gap/configuration.

Control enable

Control enable is active when a start command was activated. After position reached, this output is deactivated after the time selected in parameter/axis/times.

Position reached

Signal position reached (dynamic/static)

If a zero is entered in parameters "gauge/times/position reached", the output is static.

If a value is entered in parameter "gauge/times/position reached", the output is dynamic for this time.

Tolerance zone

If position within the tolerance zone is reached, this output is activated.

Retract run

This output is active while the retract run is running.

Reference run

This output is activated while reference run is running.

Quantity reached

Dynamic or static, selected in parameter system/settings/system settings/time quantity

Cut enable

This output is activated when all axes are in the demand position.

Cut length reached

This output is activated when the cut length is reached.

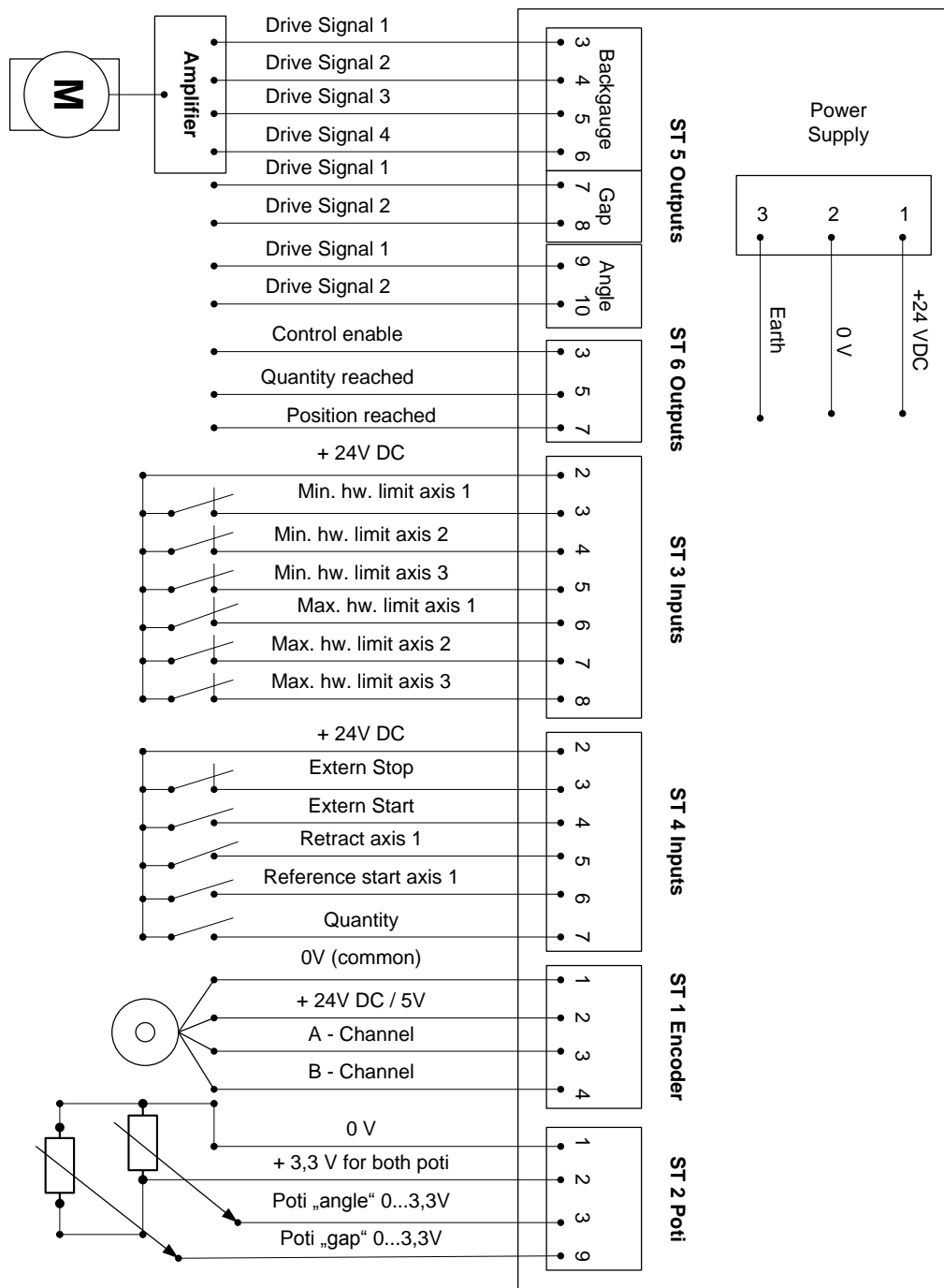
Program mode active

This output is activated when the program mode is active.

Program end reached

This output is activated when the program end has been reached.

7.2.4. Example for Connection Diagram



7.3. Diagnostics

The modules for inspecting, maintenance, control and safety/security are provided in this register:

- (1) Input test – The inputs can be inspected with this function.
- (2) Output test – The outputs can be inspected with this function.
- (3) Keyboard test – The functioning off he keys can be ensured in with this test.
- (4) Version info – The installed software version is displayed with this function.

8. Interferences

The following chapters describe possible causes for malfunction and the instructions to correct them. If you encounter problems check for proper installation first. Make sure that power is supplied to the system. If you observe recurring errors you might consider electrical interference suppression measures as described in section 8.2 Electrical interference suppression. If errors cannot be corrected with the following instructions please contact the manufacturer (see last page).

8.1. Security

Basics



CAUTION!

Risks of injury from improper fault clearances!

Improper fault clearances can cause serious personal or property damage.

Therefore:

- Fault clearance may only be carried out by qualified and instructed personnel
- Prior to the beginning of work provide sufficient room to assemble the equipment
- Please look for cleanliness at the place of installation; loosely around laying parts and tools are sources of accidents

If components have to be replaced:

- Look for correct installation of spare parts
- All mounting elements have to be assembled correctly
- Before resetting please ensure that all covers and protective devices are installed correctly and function properly

To ensure a perfect operation of the controller the following (external) measures have to be taken additionally:

Place of installation:

The controller should not be installed near to sources of interference generating strong inductive or capacitive interferences or strong electrostatic fields. Install the external power supply directly beside the controller to avoid long low voltage wires.

Power supply:

Connect the external power supply to a phase of 230 VAC or 115 VAC which is not used for engines. If not possible use a galvanic separation over an additional transformer.

Wire installation:

Install all wires for low voltages and encoders always separately from power wires (230 VAC/400 VAC). Avoid installing these wires close to any contactor or contactor wires.

Shielding:

All external signal wires have to be installed shielded:

1. Rotary encoder wires and analog input wires
2. Wires for all other input signals
3. Wires for all output signals
4. Wires from the power supply to the controller

All shields have to be connected centrally low ohm to PE (earth potential), connect only one sided at the controller.



NOTE!

Do not connect the controller / measuring system GND to PE (protective earth).
Do not connect the shielding on both sides to PE (protective earth).
If the PE potential is heavily "contaminated" by interference voltages try to connect the shielding to the GND potential instead of PE (protective earth).

8.2. Electrical interference suppression



Signal wires should be installed separately from load power lines and with a safe distance of at least 0.5 m to capacitive and inductive interferences such as contactors, relays, motors, switching power supplies, timed controllers.

If interferences occur in spite of applying all above mentioned measures proceed as follows:

1. Add RC elements over contactor coils of AC contactors (for example 0,1 $\mu\text{F}/100 \Omega$)
 2. Add recovery diodes over DC inductances
 3. Add RC elements over each drive phase (in connector box of the drive).
 4. Do not connect the GND potential with PE (earth potential)!
- Install a power filter before the external power supply

8.3. Restart after fault clearance

After fault clearance:

1. Reset emergency stop switch.
2. Quit disturbance on controller.
3. Make sure that no person is located in the danger zone.
4. Start operating as explained in the instructions.

8.4. EMC information

A trouble-free operation of the control devices manufactured by the company ELGO Electric GmbH can only be guaranteed if concerning assembly, wiring and operating the following basic rules are observed and adhered to:

- Use only shielded signal lines with a minimum diameter of 0.15 mm²
- To protect against electrical fields, connect the cable shield unilaterally, low resistance and low inductive with the operating lightning protection.
- Unused arteries in signal lines should be isolated from each other separately
- Isolate signal and power lines separately in long parallel lines (a distance of 300 mm is respected). Therefore, should never be different voltage levels, e.g. 230 V/50 Hz power supply and measuring
- Signal 24 VDC in one cable together low the emission by the installation of filter networks in plants with frequency. In the operating instructions of the manufacturer FU find the appropriate instructions.
- Wireless phones and Walky-talkies should never be used in the immediate vicinity of electronic devices

9. Maintenance

The unit works maintenance-free.

10. Type Designation

P40-XXX-024-XX-XX-CXXX

Positioning controller

Single axis with program memory

Construction

000 = standard
001 = special version
002 = special version for metal shears
...

Supply voltage

024 = 24 VDC (+/- 20%)

Encoder inputs

X = Not equipped
0 = A, B (PNP) 24 VDC supply voltage for encoders/24 VDC - 20 KHz
1 = A, B, 0 (PNP) 24 VDC supply voltage for encoders/24 VDC - 20 KHz
2 = A, /A, B, /B (TTL) 24 VDC supply voltage for encoders 5 V-TTL - 100 KHz
3 = A, /A, B, /B, 0, /0 (TTL) 24 VDC supply voltage for encoders 5 V-TTL - 100 KHz
4 = 1 analog input, 12 bit (only for 2nd axis)¹
5 = 2 analog inputs, 12 bit (only for 2nd axis)²

Outputs

X = Not equipped
0 = Digital Outputs (PNP)
1 = Analog output +/- 10V (PID regulated) - **not possible with analog encoder!**³
2 = Analog output 0... 10V (on request)

Options

X = Not equipped
C = Clamps
EN = input NPN (including index pulse)

Example:

P40 for metal shear applications with 24 VDC supply, 1 input with channels A, B, Z and two analog inputs, for first axis analog output +/- 10V (PID regulated), for the second axis transistor outputs, connections via screw terminals:

P40 - 002 - 024 - 15 - 10 - CXXX

¹ for special applications

² for special applications, analog inputs only for and at connector "2. axis"

³ only possible if output (drive signals per axis) "OX" or "XO"

11. Accessories

NG 13.0	Power pack Primary: 115/230 VAC Secondary: 24 VDC / 600 mA
Relay outputs	possible with separate relay card and connector cable