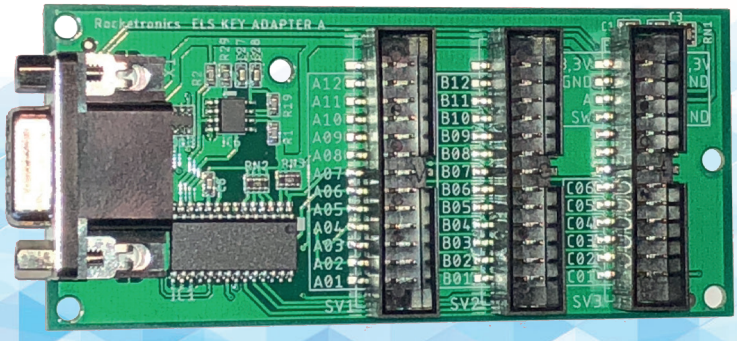
Rocketronics

ELS4 ADAPTER

User manual



Translation of the original operating instructions

ENGLISH

This manual describes the commissioning and use of the handwheel adapter for the ELS4 controller

DESCRIPTION

This manual describes the use of the handwheel adapter: An adapter board that allows the construction of a handwheel for the ELS4 Basic and ELS4 Pro cycle controllers.
The board must be installed in a handheld housing to obtain a complete handwheel and be protected against chips, dust and moisture.

The adapter board measures 100x45 mm and has a SUBD-15 socket and 3 box headers. The SUBD socket is connected to the ELS controller via a standard VGA monitor cable. The box headers provide two wires for each pushbutton via 3 supplied colour-coded flat cables with sockets, which can be soldered or screwed directly to a pushbutton.

The key functions of the adapter are identical to the key functions of the controller, they perform the same function.

The encoder connection of the adapter, on the other hand, allows more than just the rotary knob on the ELS controller: It is activated by pressing XSTEP or ZSTEP, and one of the two axes is thus switched to stepping mode. This is visible on the display of the ELS, and a sound is emitted.

By turning the encoder, the selected axis is now moved in steps. If you move in the direction of the part, the step is executed directly, if you move back, the step is made to compensate for the backlash of the axis, so it moves more than expected, but this is correct. If you turn the encoder more than one detent further, the axis will move more than one step further. But on the way back the backlash is only compensated once, so it is very easy to move back and forth.

With a button on the „ENCODER SWITCH“ connector (connector C) the step size can be switched from coarse to fine or vice versa, depending on the setting.

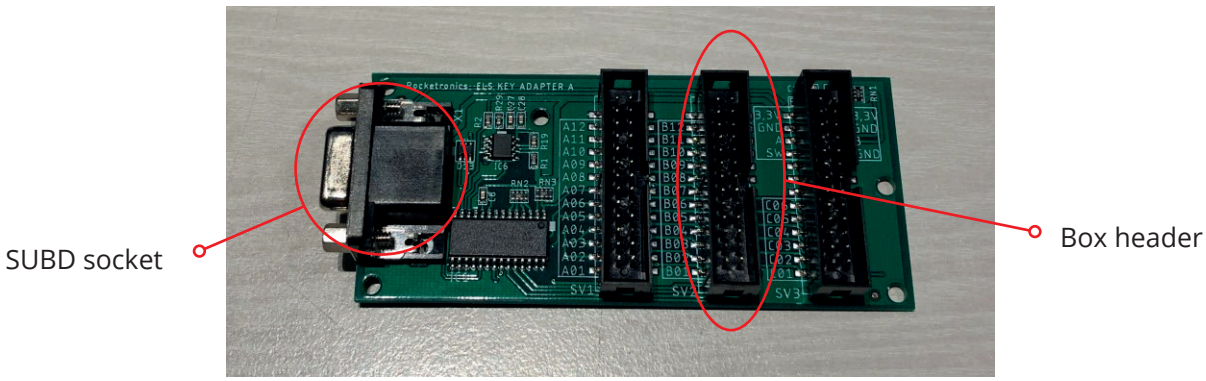
In order to move the axis faster, e.g. to cover a longer distance, you crank the encoder, after approx. one quick encoder rotation the axis switches to move mode and moves as if you had pressed one of the movement keys on the controller. This works in both directions, and in one direction the backlash is compensated for, and the ENCODER SWITCH button switches the speed of the movement, and if the movement is stopped at the encoder, the axis stops as well.

In this way, the encoder can be used to move the Z or X axis step by step with small and large steps and permanently at two speeds.

This behaviour can be changed in the settings, more about this later.

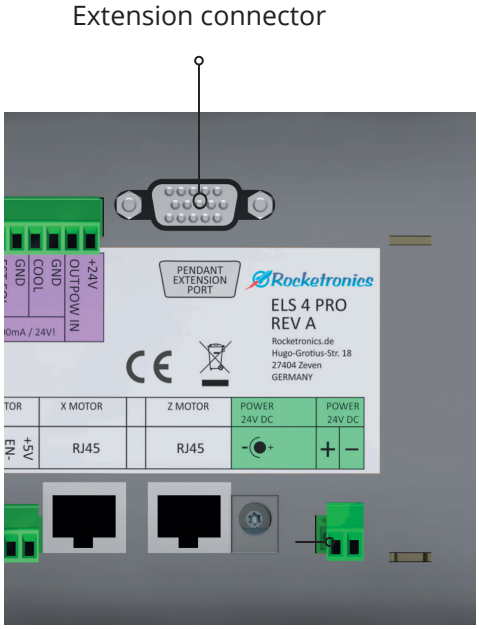
CONNECTION

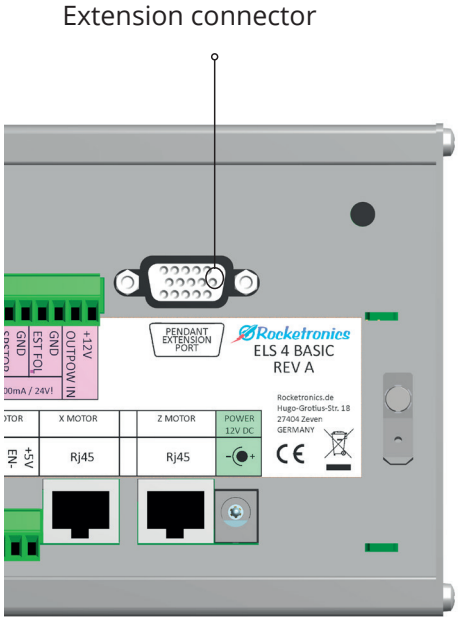
The box headers are labeled and divided into 3 groups, A, B and C. The third connector also has contacts for the connection of an encoder and a speed/stepsize change switch.



Select from the list which buttons you want to use. Then select the appropriate plug where this button is contacted, A, B or C. Then divide the flat cable in pairs so that you get a pair of wires for each button. The colour coding helps here. You can also separate the wires by simply pulling them apart.

Using a VGA cable, connect the board to the connector on the back of the ELS4:

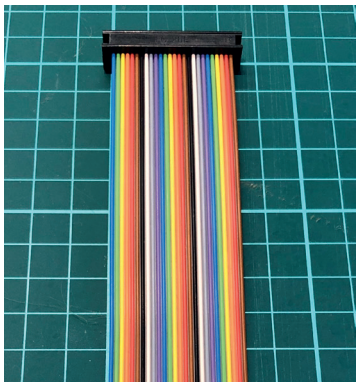


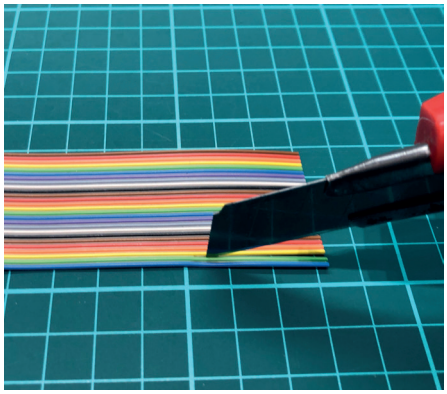


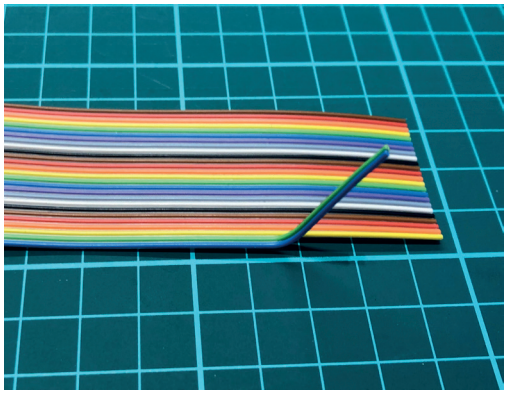
Notes:

- Use only potential-free contacts!
- Use only normally open contacts, no normally closed contacts!
- Do not apply any external voltage to any of the connections!
- Cut off unused leads of the flat cables with sharp scissors.
- The connection for the encoder supplies 3.3V with max. 100mA. Common handheld encoders with 5V operating voltage will run without problems in most cases.
- The key assignment is identical for ELS4 Basic and Pro, so you can easily connect the handwheel to another controller.
- Maximum cable length to the ELS 3 meters with shielded cable.

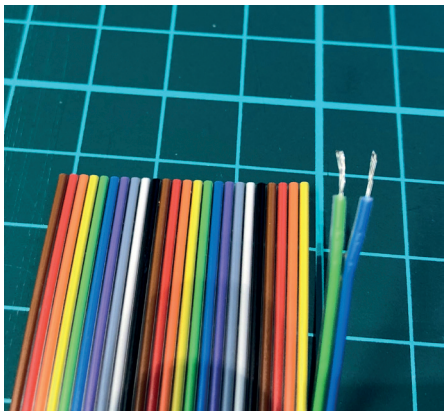
PARTING THE FLAT CABLE

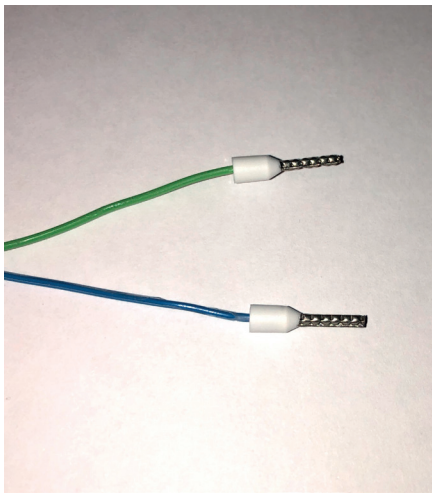


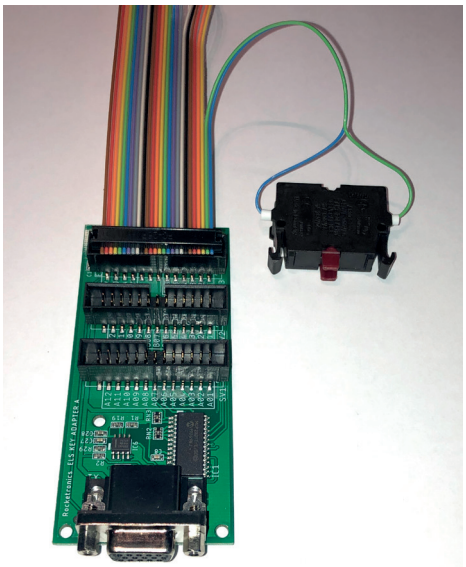




Cut the flat cable to get pairs!







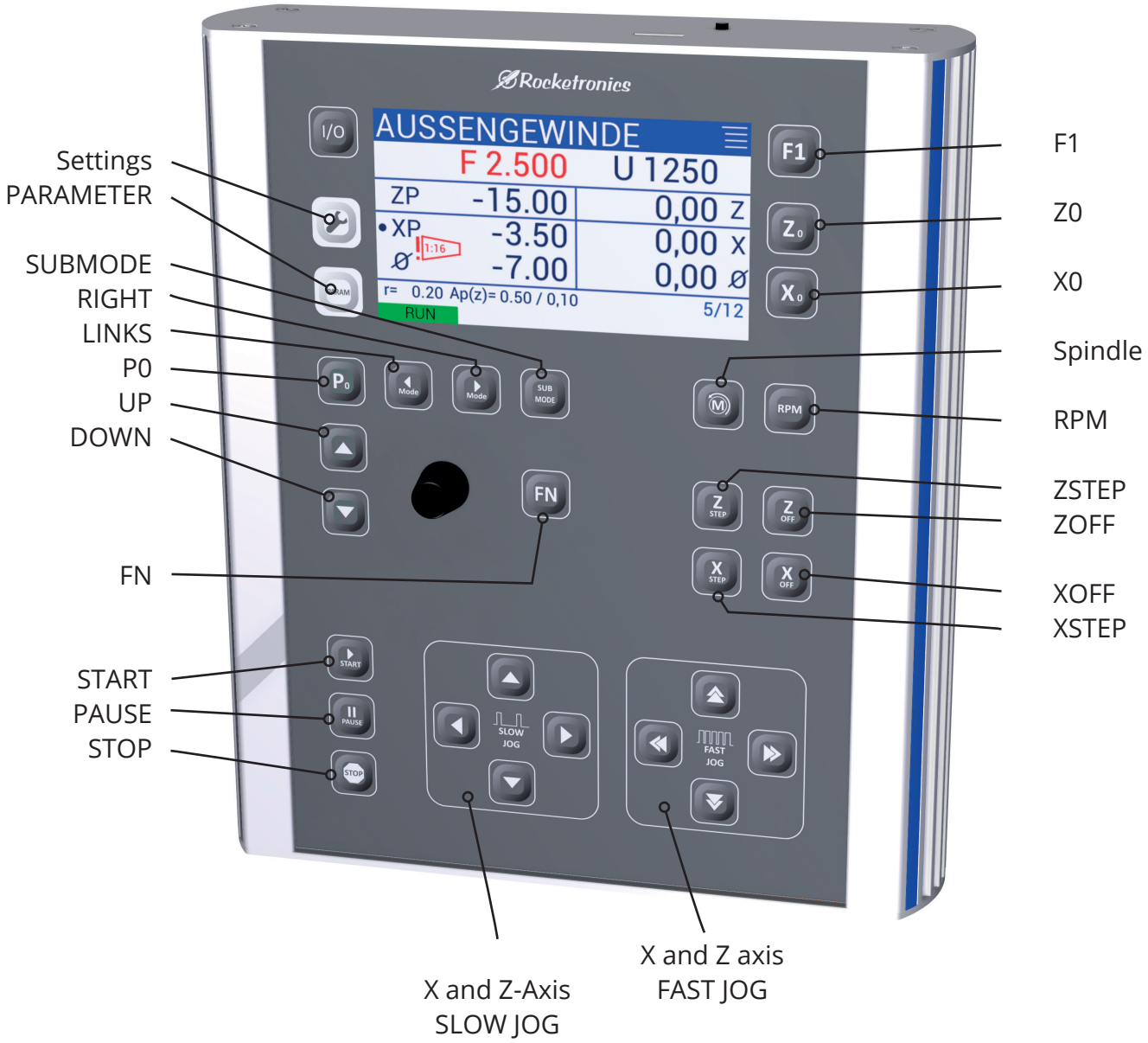
For a reasonable operation we recommend to use the encoder input with a manual encoder, furthermore the keys XSTEP, ZSTEP, X0, Z0, START, STOP and possibly the fast traverse keys for both axes. This makes it very easy to set up the machine and start and stop cycles.

Types which also allow fast rotation are usually used as handheld encoders. The encoder should run at 3.3V and output the signals A and B, and deliver approx. 100 pulse revolutions. Most of the available encoders are traded for 5V operation, but these usually run at 3,3V as well.

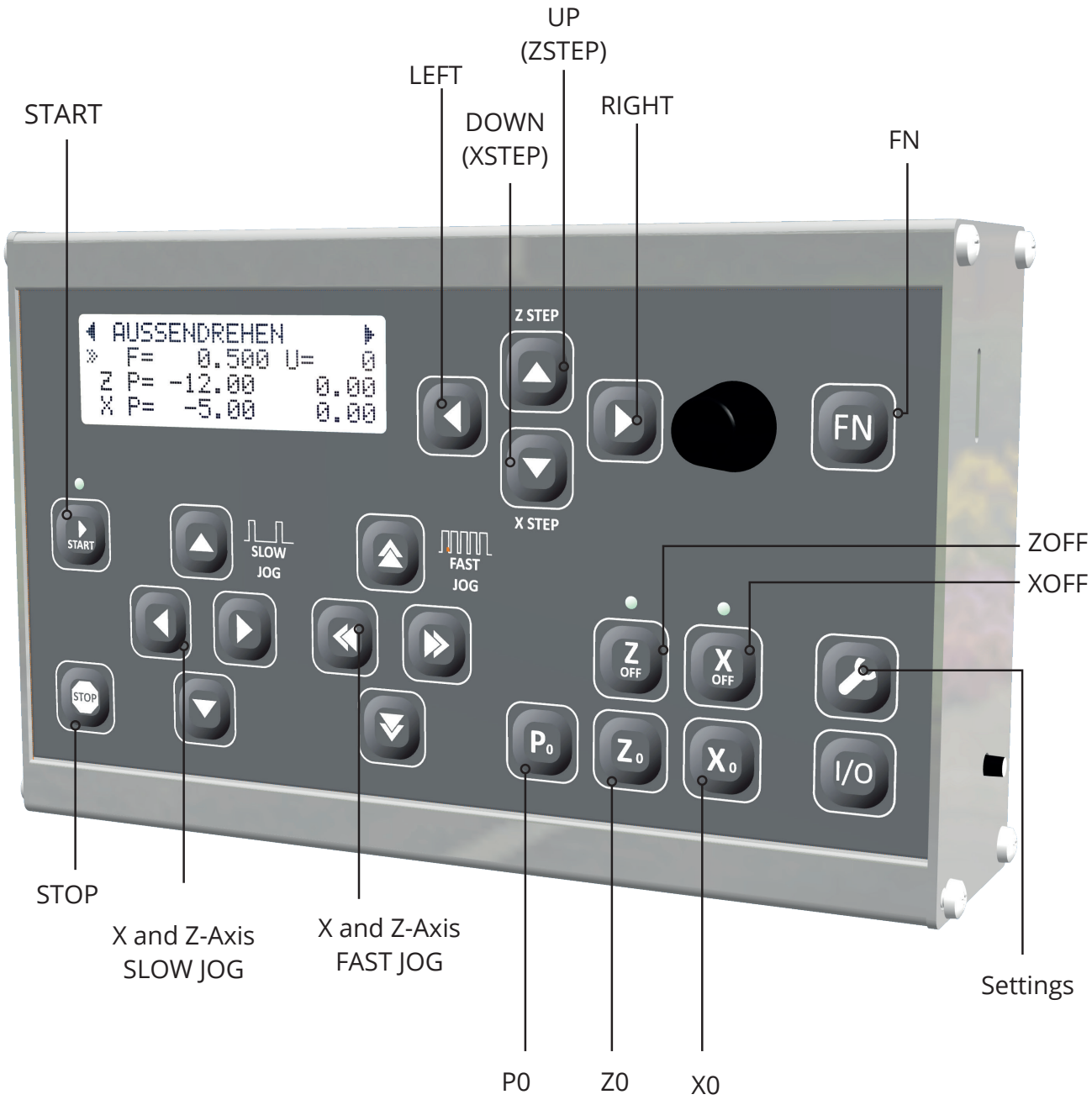
PIN ASSIGNMENT

Key	Pair of connections	Remarks
FN	A01	
X RIGHT SLOWLY	A02	Moves the X-axis to the right, slowly
UP	A03	Navigates the cursor up
F1	A04	Special function
XOFF	A05	Switches the X-axis off
Z_RIGHT FAST	A06	Moves the Z-axis to the right, fast
SUBMODE	A07	Switches to submode (PRO only)
Z LINKS SLOWLY	A08	Moves the Z-axis to the left, slowly
P0	A09	Sets the currently selected position to 0
RPM	A10	Changes the spindle speed (PRO only)
ZSTEP	A11	Switches to the stepwise mode of the Z-axis
Z LEFT FAST	A12	Moves the Z-axis to the left, fast
RIGHT	B01	Navigates to the right
STOP	B02	Stops a cycle
PARAMETER	B03	Opens the parameter menu
X0	B04	Sets the X axis to 0
XSTEP	B05	Switches to the stepwise mode of the X-axis
X RIGHT FAST	B06	Moves the X-axis to the right, fast
LEFT	B07	Navigates to the left
PAUSE	B08	Pauses a cycle
SETTINGS	B09	Opens the settings
Z0	B10	Sets Z to 0
ZOFF	B11	Switches the Z-axis off
X LEFT FAST	B12	Moves the X-axis to the left, fast
X LEFT SLOW	C01	Moves the X-axis to the left, slowly
START	C02	Starts a cycle
DOWN	C03	Navigates down
SPINDLE START/STOP	C04	Starts the spindle
Z RIGHT SLOW	C05	Moves the Z-axis to the right, slowly
ENCODER SWITCH	SW GND	Button change stepsize from Fine to Coarse, make contact between SW and GND
ENCODER	A B	Channel A of the encoder Channel B of the encoder
GND Encoder	GND	2x Ground output
Power Encoder	3,3V	2x power output with 3.3V max. 100mA

ELS4 PRO BUTTONS AVAILABLE VIA THE ADAPTER



BUTTONS OF THE ELS4 BASIC AVAILABLE VIA THE ADAPTER



In addition to the buttons on the controller, the following buttons are available for the ELS4 Basic, which are only available via the extension

- XSTEP - This allows XSTEP to be activated directly.

- ZSTEP - This allows ZSTEP to be activated directly.

- PARAMETER - Opens the parameter menu
- F1 - Opens special function
- PAUSE - Pauses one cycle if possible

SETTINGS

The adapter can be operated with all ELS4 Pro and Basic from software version 6. If the software is older, an update must be installed first!

The rotary encoder on the adapter allows the axes to be moved stepwise but also permanently, so there is a step mode and a move mode. The axis must first be activated by pressing XSTEP or ZSTEP. The selected axis then moves analog to the direction of rotation on the encoder. If you crank quickly, the system switches seamlessly from stepping to moving mode.

The step size in step mode is set in the ELS settings, via SETUP DATA -> STEPS 1 and STEPS 2
The driving speeds in driving mode are set in the respective axle drives under SETUP Z/X-MOTOR -> F SLOW < > and F RAPID << >>.

In version 6 you will find a new group EXPANSION in the settings, where there are 6 parameters that determine the response of the encoder. They are preset to values that are well suited for an encoder with 100 pulse revolutions.

ON-THRESHOLD TIME *(0,1-8,0 ms, 4,0 ms=Standard)*
This is the time that must elapse between two successive pulses from the encoder for the rotary motion to be classified as „slow". Slow pulses lead to single steps of the axis. If the pulses come faster, they are classified as „fast". If the number is high, you have to crank slower to switch to drive mode, if the number is low, you have to crank faster.

If the number of fast pulses received without interruption is higher than
ON-THRESHOLD COUNTER *(1-500, 100=Standard)*
the axis is switched to drive mode, it then drives permanently.
If the number is high, you need more fast impulses to switch to driving mode', so you have to crank longer fast.

If you stop turning abruptly, the axis also stops after the
OFF-THRESHOLD TIME *(1-350 ms, 100=Standard)*
This is the time after which the axis is switched back from drive mode to step mode. 100 ms is a good time, if you want faster reaction you can lower it.

To avoid leaving the driving mode again and again due to slight fluctuations when the encoder is turned quickly, which would result in a very jerky driving picture, there is a threshold setting, the number of pulses in
***OFF-THRESHOLD* COUNTER** *(1-500, 20=Standard)*
indicates how many slow pulses must be received in succession in order to leave the driving mode. Higher values allow you to crank very unstable, lower values allow you to leave the driving mode quickly when cranking slower.

REPEAT-TIME *(1-500 ms, 100 ms=Standard)*
Concerns only rides away from material. If the encoder is turned slowly for a longer period of time, several single steps are output one after the other. This parameter indicates the time that must elapse after the last step to compensate for backlash.

STEP-MODE (0-3, 0=Standard)
In mode 0, when the ENCODER SWITCH key is released, a large step is made with one pulse, and a small step is made with the ENCODER SWITCH key held down. Turning faster switches to the driving mode. With the switch pressed a fast speed is made, with the switch released slow speed

Mode 1 is the other way round in terms of step size: without pressing the switch small steps are output, with switch pressed large steps. The same is true for driving mode: If you don‘t press the switch, you drive slowly. If you press the switch, you drive fast.

Mode 2 is like mode 0, except that the driving mode is deactivated, i.e. only step by step.

Mode 3 is like mode 1 without driving mode.

Mode	Step size without Switch	Increment with Switch	Travel speed without Switch	Travel speed with Switch
0	big	small	quick	slow
1	small	big	slow	quick
2	groß	small	locked	gesperrt
3	big	big	locked	locked

Tips:

If the controller does not switch to drive mode even when the encoder is turned very quickly, increase the „on threshold time“ step by step: For an encoder with 100 pulsesU, approx. 4ms should fit, for 200 pulses correspondingly 2 ms.

If it switches too fast in the driving mode, reduce this time or increase the „on threshold counter“. For the former, crank faster, for the latter, crank longer to switch to drive mode.

If, despite fast cranking, the driving mode is repeatedly left briefly, increase the „off threshold counter“.

If the drive mode lasts too long after an abrupt stop of the encoder rotation, reduce the „off -threshold time“.

If you do not want to have a driving mode, select the mode numbers 2 or 3.

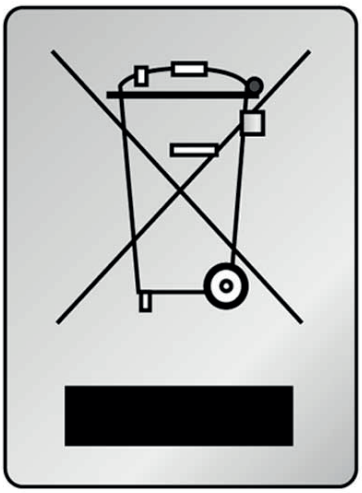
EXAMPLE

As an example, a handwheel in a Bopla BS 800 hand-held enclosure is shown here: The printed circuit board is mounted in the lower shell and is easy to screw on using 3 spacer bolts 3 mm high. A pushbutton type Schurter MCS 18 and a handheld encoder with 100 pulse revolutions are used here.

3D-CAD data for the construction proposal can be found here: https://a360.co/2Rr1HZe
A drawing: https://a360.co/2RxvgbH
The adapter board is available under https://a360.co/2U4uogx

DISPOSAL

This device must not be disposed of with the household waste!



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