User Manual

WIN-Commander

Version 6.1

LANG GmbH & Co KG
Dillstraße 4
D- 35625 Hüttenberg
Tel +49 6403 7009-0
Fax. +49 6403 7009-40

Doku-Nummer:
D22307-0070-0de

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1 Introduction

In conjunction with a Windows operating system, the user-friendly operating program WIN-Commander Version 5 is designed for easy start-up of the control units LSTEP-PCIexpress and LSTEPexpress. All necessary default settings (spindle pitches, positional values, accelerations, speeds of travel, etc.) can be defined as SI-units in menus and can be transmitted to the controller. The complete command set of the positioning systems is available "at the click of a mouse button".
Furthermore, complex motion sequences (chains, meanders) can be created, managed and executed with ease.

1.1 Equipment

- Menu-guided configuration of all control parameters (axis acceleration, axis speed, spindle pitch, idle current, etc.).
- Complete command set for the control units LSTEP-PCIexpress and LSTEPexpress.
- Clear and simple user interface with continuous monitoring of the actual control status.
- Automatic generation of meanders with adjustable incrementation.
- Convenient Teach-In function: Selected positions can be approached using the joystick. The position data are then taken over into complex motion sequences.
- The created motion sequences can be saved as a file.
- Online change of language.

1.2 System Requirements

- Pentium or higher
- Microsoft® Windows ® XP 32 Bit / (Microsoft® Windows ® 7 32 Bit + 64 Bit) or higher
- Minimum 20 MB of free hard drive space

1.3 Text Convention

The following text conventions have been applied in this manual:

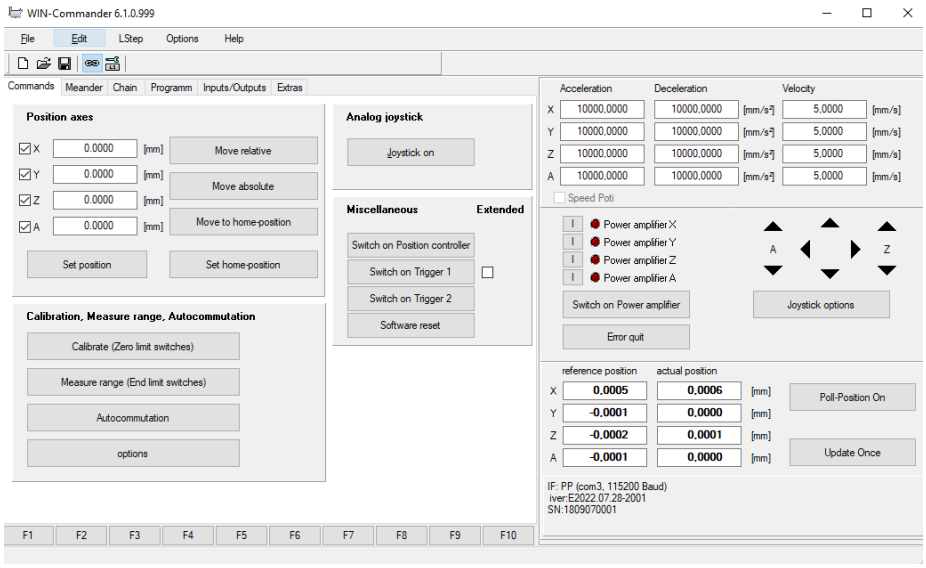
Bold	All objects of the user interface, such as, e.g. buttons, input fields, etc. are shown in bold print.
Bold	The parameters in Chapter 2 are shown in a bold, sans-serif font.
„ .."	Menus, names and designations are shown in quotation marks.
< >	Keys or key combinations appear in angle brackets, e.g. <Ctrl+J> for the keys "Control" and "J".

2 Description of the user Interface

The WIN-Commander user interface and its elements are described in this chapter. The layout of the interface and how to enter data are explained. As WIN-Commander is a Windows program, any user, who is familiar with that operating system, will quickly find his way around the WIN-Commander program.

2.1 Elements of the User Interface

After WIN-Commander has been started, the user interface appears as shown below.



2.1.1 The Title Bar

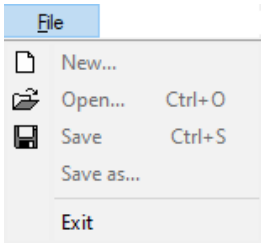
The title bar contains the program name and version number and provides Windows-specific options for maximizing, minimizing, or scrolling the user interface, and for closing the program.

2.1.2 The Menu Bar

The five main menus “File”, “Edit”, “L-Step”, “Options” and “Help” are located in the menu bar. Click on the respective menu name with the mouse to open a list of commands for that menu.

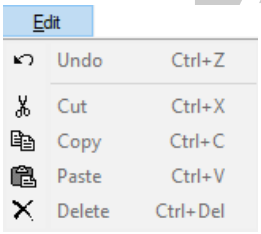
3.1.1.1 The “File“ Menu

The file operations “New”, “Open”, “Save” and “Save as” are available on the **Chain** and **Program** tab panels. On the **Meander** tab panel, you can save meanders or open existing meanders.
The menu item “Exit” closes the WIN-Commander.



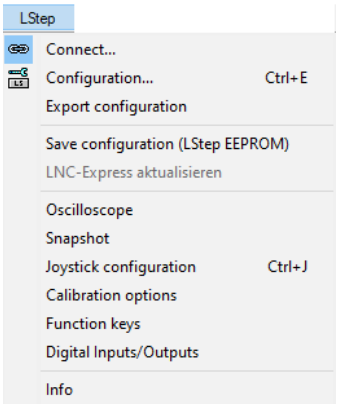
2.1.3 The "Edit" Menu

The "Edit" menu offers functions for cutting, copying, pasting and deleting value in input fields. The value in question must be highlighted (selected) for this purpose. The functions are also available as key-combinations, which are shown in the menu at the right of the item. It is also possible to undo an operation.



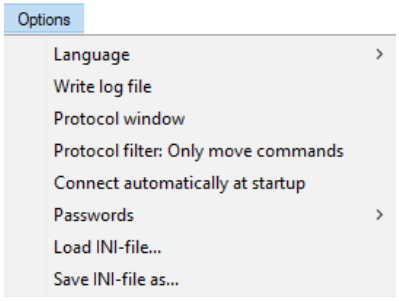
2.1.4 The "LStep" Menu

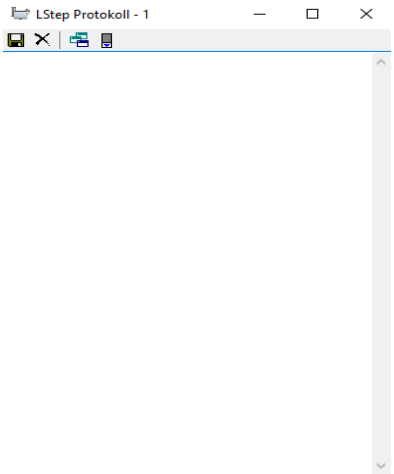
The "LStep" menu offers a series of setting options for configuring WIN-Commander. The individual menu items are described in Chapter 3.



2.1.5 The "Options" Menu

The menu item "Language" is used to select whether the WIN-Commander user interface should be displayed in German, English or French.
If the menu item "Write log file" is activated, the communication with the controller is saved to the log file "LStep4_1.log". The data in the log file is retained after the menu item is deactivated. The file is then emptied when the menu item is re-activated. To permanently save the data, the contents of the protocol window can be saved to a file.
If the menu item "Protocol window" is activated, a window appears in which the communication with the controller is displayed online.






When you click on this button with the mouse, the Windows "File" dialog appears, and you can save the contents of the window as a text file. Such a file can be useful for localizing the problem in the event of a malfunction.

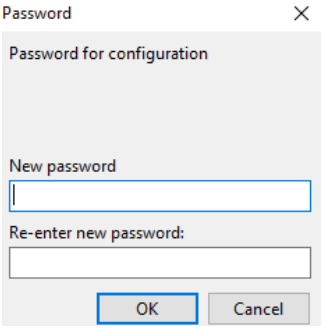

Click on this button with the mouse to delete the contents of the window.


When this button is activated, the protocol window is always displayed in the foreground.


Activate this button to switch on the automatic scrolling function in the window.

The menu item "Protocol filter: Only move commands" determines that only move commands are logged in the protocol window and in the log file.

When the menu item “Connect automatically at startup” is activated, connection to the controller takes place automatically when WIN-Commander is started.



In the “Passwords” menu item, passwords can be entered or changed. The writing and editing of programs on the **Program** tab panel and the changing of control settings in the “Configuration” menu can be protected by means of passwords.

2.1.6 The Toolbar

The toolbar contains buttons (icons) with which you can quickly access menu items that are needed often.
They provide you with direct access to the menu items “New”, “Open” and “Save” from the “File” menu, and to the menu items “Connect” and “Configuration” from the “LStep” menu.

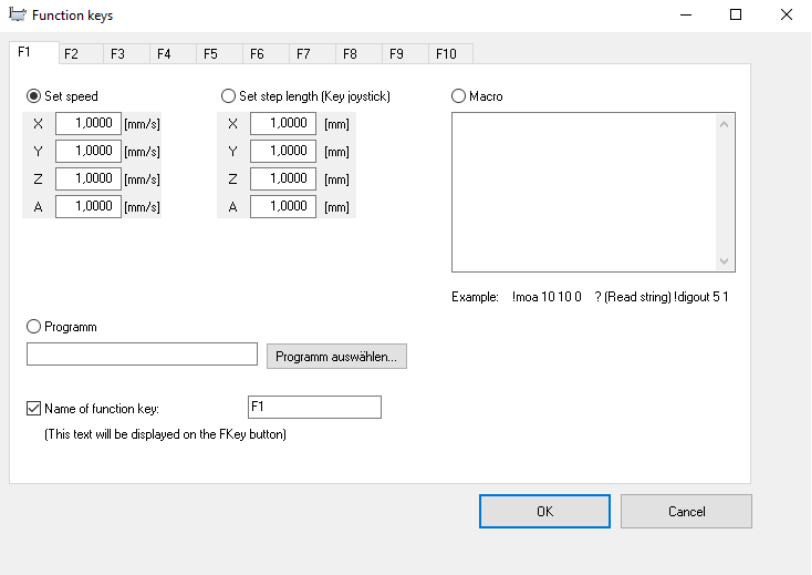
2.1.7 Tab Panels

The **Commands**, **Meander**, **Chain**, **Program**, **Inputs/Outputs** and **Extras** tab panels contain all functions and commands needed for safe movement of a coordinate table. These tab panels are designed like index cards. While one tab panel is open, only labelled tabs can be seen for the remaining five-tab panels. The respective tab panel can be opened by clicking on the appropriate tab. The tab panels are described in Chapters 4 through 9.

2.1.8 Function Keys

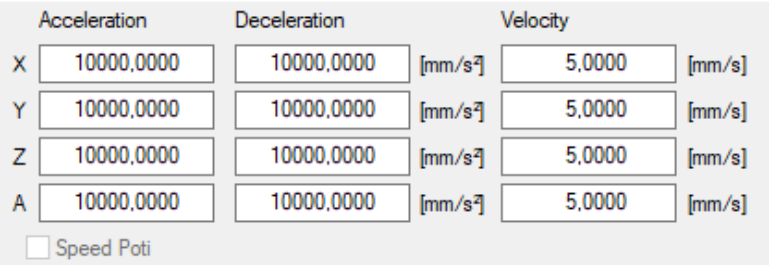
The function keys F1-F10 appear below the tab panels. The functions and names assigned to these keys can be customized.

To customize the function keys, open the menu “LStep / Function keys”. The following tab panel appears:



Click on the appropriate tab to select the desired function key. Activate the radio button **Set speed**, if the function key is to be used for changing the speed of the axes or activate the radio button **Set step length (Key joystick)**, if the key is to be used for changing the step length of the key joystick. Activate the radio button **Macro**, to enter a series of instructions into the text field, which are to be processed when that function key is pressed.
To assign an individual name to a key, you must first activate the **checkbox Name of function key**. You can then enter the desired name in the input field. The inputs are applied when you exit the window by pressing the **OK** button.

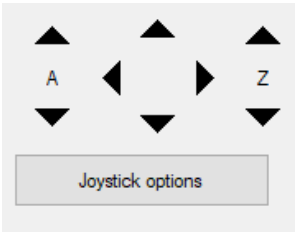
2.1.9 Display of Acceleration and Speeds



At the top right, next to the tabs, there are three columns of input fields in which the present acceleration values, deceleration values and velocities (speeds) are displayed for all four axes. The values can be edited. The values are input in the in the set user unit of measure. The unit of measure for the velocity and acceleration can be changed in the branch of each axis in the "LStep/Configuration" menu under the menu item "Dimension". The entered values are linked with the parameters in the Kinematics branch of the individual axes.
If the checkbox **Speed Poti** is activated, the speed of the motors can be controlled with the "Speed" potentiometer at the controller (if present).

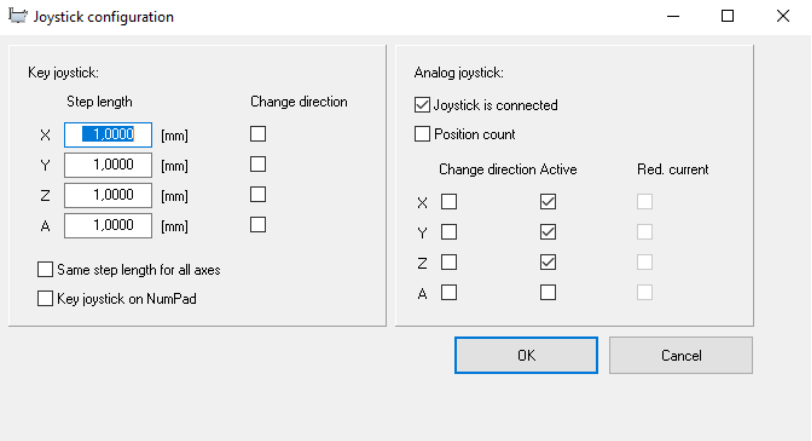
2.1.10 Key Joystick

The control panel for the key joystick is located below the speed display. The cursor keys permit you to move the axes by means of a simple mouse click.



2.1.11 Configure Joystick

The **Joystick options** button opens a window in which you can configure the key joystick and the Analog joystick. You can also open this window via the "LStep /Joystick configuration" menu or by pressing the key combination <Ctrl-J>.

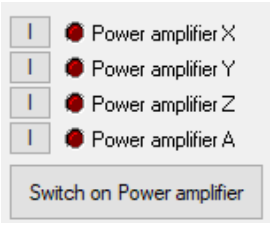


For movement of the axes using the keys or using the numeric keypad, the step length can be set for each axis in the left-hand section of the window.

If the checkbox **Same step length for all axes** is activated, all axes are set to the X-axis value. The preceding sign of the movement can be reversed with the checkbox **Change direction**. If the numeric keypad is to be used for control purposes, the checkbox **Key joystick on NumPad** must be activated.
To activate a connected, Analog joystick, the checkbox **Joystick is connected** must be activated. By activating the checkbox **Position count,** the position indicator is refreshed when the axes are moved with the joystick.
Settings for the individual axes can be made in the checkbox matrix below that. The preceding sign of the respective axis can be reverse in the "Change direction" column. The "Lock axis" column enables you to lock an individual axis to prevent it from being moved accidentally. In the column "Red. Current" you determine whether the motor current is to be switched to idle current when the axis is not being moved. The entered values are linked with the parameters in the Manual Operation /Joystick branch of the configuration tree for the individual axes.

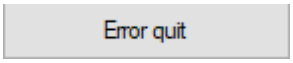
2.1.12 Power Amplifiers On/ Off

To switch on the power amplifiers for all axes, click on the **Switch on Power amplifier** button**.** The power amplifiers can be switched on individually for each axis by pressing the respective **I** button. It is thus possible, e.g. to switch off the X power amplifier if you want to pull the plug at the X-axis motor. The LEDs are displayed in red when the power amplifiers are switched on.



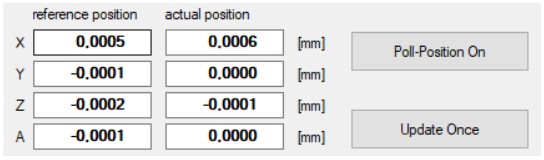
2.1.13 Error Quit

Click on the **Error quit** button to acknowledge the presently active error.



2.1.14 Display of Coordinates

The coordinates are displayed for up to four axes below the LStep version. These values are relative to the zero point (absolute) and always show the present position of the coordinate table. The unit of measure can be changed in the branch of each axis in the "**LStep/Configuration**" menu under the menu item "**Dimension**". For a better overview both the reference and the actual position are displayed at the same time. On the right side of the coordinate displays there are two buttons. The first button **Poll-Position On** activates the positional polling that refreshes the displayed coordinates. The button **Update Once** refreshes the displayed coordinates once. The advantage of not using the **Pol-Position On** Button is, that the controller is not burdened with unnecessary positional polling.



If a 3-axis controller is connected, only the coordinates of the X, Y and Z axes will be displayed.

2.1.15 LStep Version

The port of the connected controller and the serial number and internal version number are displayed below the display of coordinates.

2.2 Use of Mouse and Keyboard

The user interface is set up in such a way that all functions can be executed safely with the mouse. The keyboard is only needed for some input functions.

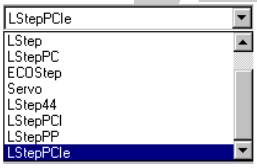
2.2.1 Keys/Buttons, Tab Panels and Menu Bar

All keys/buttons, tab panels and the menu bar can be operated with a click of the mouse.

2.2.2 Input Fields

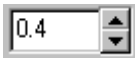
WIN-Commander has four different types of input fields, in which parameters can be edited and settings can be made.

2.2.3 Input Field with Drop-Down Selection List



These input fields have a square button at the right-hand side. When you click on this button with the mouse, a list with a selection of WIN-Commander options appears, from which a selection can be made by clicking on the desired option with the left mouse button. After an option has been selected, the list closes and your selection is displayed in the input field.

2.2.4 Input Field with "Up and Down" Buttons



These input fields have an "up" and a "down" arrow button at the right-hand side. The numeric values in these input fields can be increased or decreased step by step by clicking on the up or down button accordingly. You can also click and hold down the mouse button. The numeric values then increase or decrease continuously until you stop pressing of the mouse button. Alternatively, the numeric values can be entered via the keyboard.

2.2.5 Radio Buttons and Checkboxes

In WIN-Commander, checkboxes are used for simple On/Off, Yes/No decisions. Multiple selections are possible with the checkboxes. If, however, the settings are mutually exclusive, then radio buttons are used. The status of the checkboxes is reversed (on/off) (i.e. they are activated or deactivated) by clicking on them with the mouse. A click on a radio button within a group activates that option and deactivates all the other options in that group.
If a checkbox is active, a checkmark appears in the box; if a radio button is active, a dot appears in the radio button.

2.2.6 Input Fields for Numeric Values

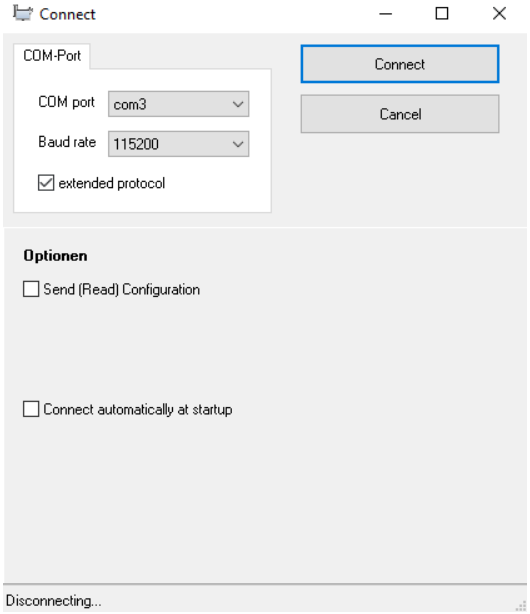
Numeric values can be entered into these input fields via the keyboard. To do so, double-click with the left mouse button on the input field to activate it. The numeric value then appears highlighted. A new numeric value can then be entered via the keyboard. The old value is automatically deleted at the same time. Alternatively, with a simple click of the mouse, the cursor can be positioned at the end of the numeric value that is to be changed. The old numeric value can then be deleted by pressing the backspace key and a new value can then be entered.

In some cases, the keyboard can also be used for operation/navigation of user interface. Here is a quick reference guide:
Each command, each menu and each input field can be accessed by pressing the <Alt> key plus the underlined letter or number of the respective command name, menu name or input field name.
Alternatively, within a tab panel, you can "jump" from the active input field to the next input field by pressing the <Tab> key.

3 The "LStep" Menu

3.1 Connection

If you have activated the function Connect automatically at startup in the "Options" menu, the connection is automatically established when the program is called. If the automatic connection function is not activated, the "Connect" window can be opened using the "Connect" item in the "LStep" menu, or by pressing the button. The settings for the connection are made in this window. To make the connection, click with the mouse on the **Connect** button.



3.1.1 Options

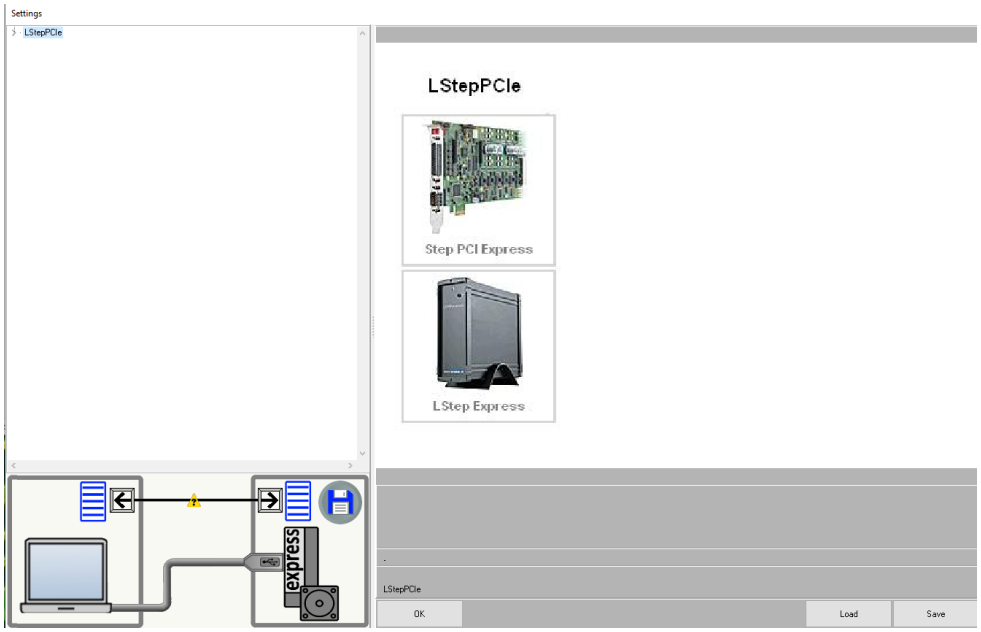
You can select whether the control settings (configuration) are to be sent when connecting, and the direction in which this is to take place.
You can also select whether the connection to LStep is to take place automatically the next time WIN-Commander is started.

3.1.2 COM or USB Ports

The connection to all controllers of the Express series takes place via a COM port. On the model with housing, the COM port is made available via the USB, Ethernet, or RS232 interface. On the PC model, the PCI Express interface is used for these purposes. The speed of the data transfer, the so-called baud rate, is selected in the bottom field of the two combination fields.
Activate the checkbox extended protocol to activate the extended protocol feature. With this feature, error messages are displayed in a separate window. The messages are generated by the controller.

3.2 Settings

You can open the "Settings" window either via the item "Configuration" in the "LStep" menu or by pressing the  icon on the toolbar. General settings are made here for adapting WIN-Commander to the hardware.

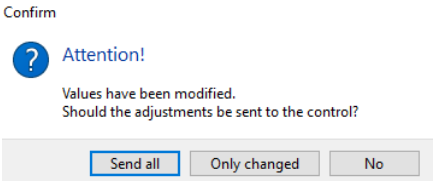


The "Settings" window has a tree structure at the left-hand side, in which the settings are arranged hierarchically.
At the right-hand side of the tree structure, explanatory graphics are displayed, depending on where you are presently located within the tree structure. The graphics are further supported by the text window below.
Below that, there are two lines. The top line shows the branch of the tree structure that is currently active. The bottom line shows the element of the tree structure that is currently highlighted. If this element is not a node but rather a parameter for which a value can be entered, an input field also appears here.

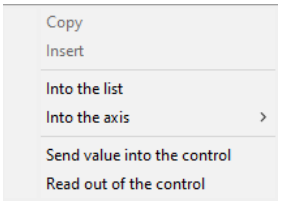
The parameters can be transferred either from the PC to the controller or from the controller to the PC using the arrows in the graphic at the bottom left. The symbol in the middle of the graphic shows whether the settings in the controller and on the WinCommander are the same. If there is a yellow triangle with a question mark in the middle  , then the controller settings are different to the settings of the WinCommander. If there is a green check sign in the middle  , then the controller and the WinCommander have the same settings. To save the current settings in the controller you can use the disk symbol. If the settings are saved of the controller, they are remembered even if the controller is turned off.
The Button **Save** on the bottom right side of the window enables the user to save the entire tree or a part of the tree to a file with the extension "ls-save ". With the Button **Load** also on the bottom right

the user can load a file with the extension “ls-save“ to the settings tree.

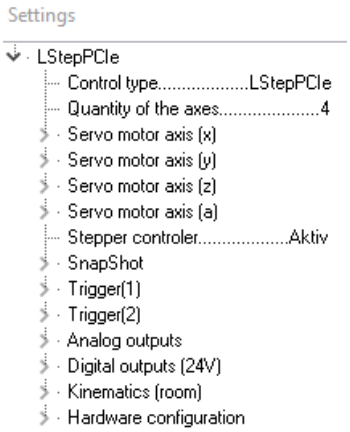
When you click on the **OK** button, the dialog box shown here opens. If the user presses the **Send all** buttons all settings are send to the controller. If the user presses the **Only Changed** button to exit the dialog, the changes made are sent to the controller and are saved in the tree structure.
Conversely, if the No button is pressed to exit the dialog, the changes are not sent to the controller but are saved in the tree structure. Another dialog box then opens to warn you that data in the tree do not correspond with the data in the controller. After the dialog boxes have been closed, the “Settings” window also closes.



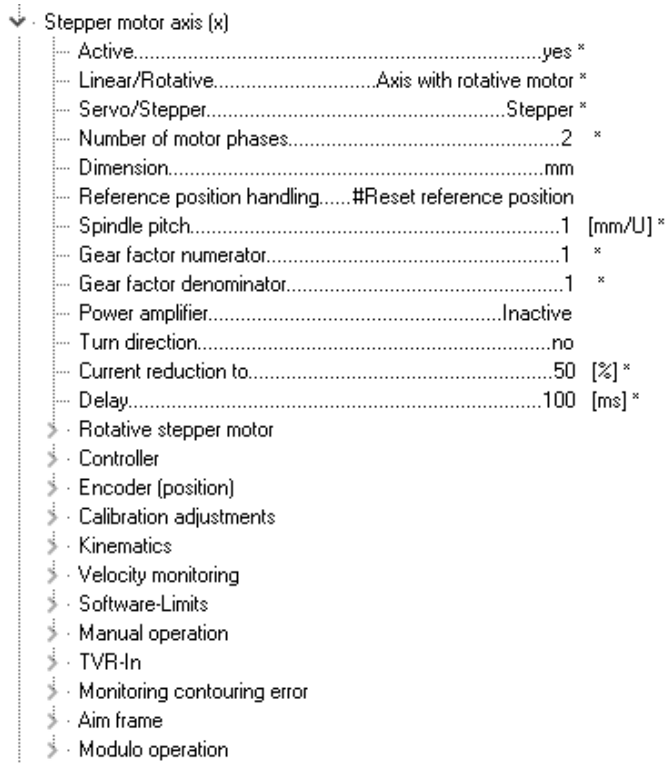
If you click on a highlighted node with the right mouse button, a context menu appears. Use the **Copy** function to copy the highlighted node with all its branches. Use the **Insert** function to insert the copied data into another branch with the same parameters.
With the function **Into the list**, the highlighted node is saved to a file and the file name is inserted into the list in the right-hand section of the window. This enables you to save part of the tree under different names so that you can load it quickly from the list. For speedy insertion, the area in the list can be highlighted, the right mouse button pressed, and the function Insert selected. For each node in the list, only those files are displayed that contain the corresponding data.
With the **Into the axis** function, you can copy branches from one axis to another axis or to all axis branches.
To send the set values of the branch to the controller, select the function **Send value into the control**.
To read out the control settings of a branch, select the function **Read out of the control**.



The parameters “Control type” and “Quantity of the axes” are located under the main node. There is also a branch each for Snapshot Trigger (1), Trigger (2), Analog outputs, Digital outputs, Kinematics, Hardware configuration and one branch each for each axis. As all four axis branches are basically the same, only the parameters for the X-axis are explained below. The control type is recognized automatically.
The number of connected axes determines which motor axes are displayed in the tree structure and can be parameterized. A star behind a parameter means that this setting is different to the setting in the controller.



3.2.1 Stepper motor axis (X)



Active

The axis can be activated or deactivated. When the axis is deactivated, no more parameters are available.

Linear/Rotative

Choice of either a rotary or linear motor.

Servo/Stepper

Choice of either a servo or a stepper motor.

Number of motor phases

Number of phases of the stepper motor (1, 2, 3).

Dimension

The dimension, i.e. unit of measure, for the axis can be selected here. All adjustments/settings must be undertaken in the unit of measure selected here. The position readout for the axis also appears in the selected unit of measure.

Spindle pitch
Drive factor (gear ratio)

To adapt the respective axis to WIN-Commander, the spindle pitch must be entered in millimetres and the drive factor must be entered separately as numerator (counter) and denominator.

Power amplifier

Turn the power amplifier on and off.

Turn direction

The parameter “Turn direction” is used to change the direction of rotation of the motor and of the encoder and to change over the limit switch position.
In the “Calibration adjustments” branch, it is also possible to just change over the limit switch, or under “Rotative stepper motor”, you can reverse the direction of rotation of the motor only. If you only want to change the direction of rotation of the encoder, this can be done under “Encoder”.

Current reduction

To prevent unnecessary heating of the motors in stepper motor mode, the current is reduced to the value specified in "Current reduction" when the motor is idle. The value is specified as a percentage of the nominal current. For a value of 40, the current is reduced to 40% when the motor is idling.

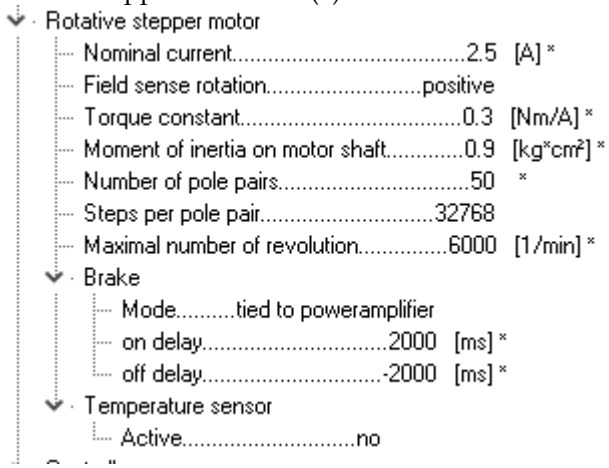
Delay

The parameter "Delay" defines the time in milliseconds that must elapse after the axis has come to a stop until the current is reduced.

The available motor torques are reduced by the current reduction. The position of the table can therefore shift minimally in stepper motor mode without encoder or when the actuator is switched off. switched off.

3.2.2 Rotative Stepper Motor

This branch only exists when a rotative stepper motor was selected under "Stepper motor axis(x)".



Nominal current

Nominal current of the motor

Field sense rotation

The parameter "Field sense rotation" can be used to change the direction of rotation of the motor without changing the direction of rotation of the encoder or changing over the limit switch.

Torque constant
Moment of inertia on motor shaft

These values are not needed for stepper motor operation.

Number of pole pairs

Number of magnetic pole pairs of the stepper motor.
50 Pole pairs = 1.8° step angle
100 Pole pairs = 0.9° step angle

Steps per pole pair

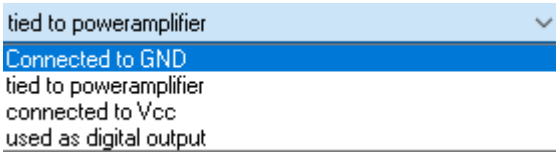
Number of steps per pole pair. The resolution of the microstep operation can be adapted to the application with this parameter. 32768 MI/pole pair is the maximum resolution. It is only achieved when the current has been set to the maximum.
1000 MI is the resolution of the predecessor control LStep and is needed for customer programs with the dimension MI for compatibility reasons.

Maximum number of revolutions

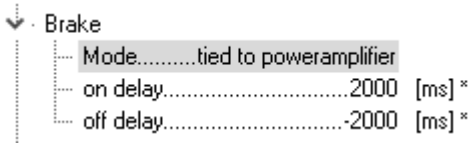
The adjustable speed of rotation of the motor can be restricted to a maximum value with this parameter.

Brake – Mode

The level of the motor brake output can be specified via the Mode parameter.

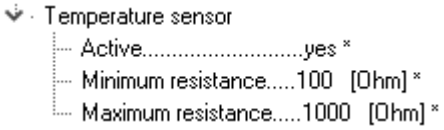


If digital output mode is selected, the motor brake can be used like a digital output. For more detailed information, refer to the documentation for the controller. If the brake is tied to the power amplifier, a delay can also be entered.



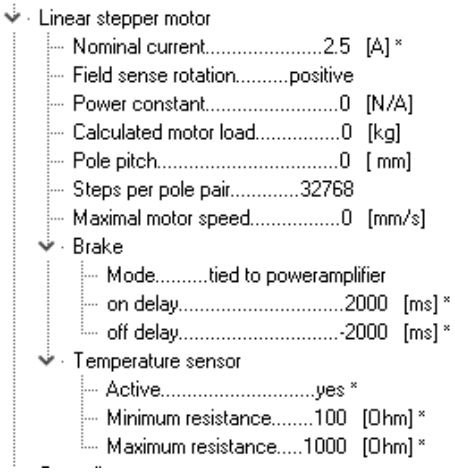
Temperature sensor

If this parameter is activated, a temperature-dependent resistance can be evaluated by the controller. This may be, e.g. a PTC resistor in the motor.



A minimum and a maximum resistance can be entered. If the measured resistance falls below or exceeds the value range that has been entered, the corresponding power amplifier is stopped.

3.2.3 Linear Stepper Motor



The parameters are the same as those for the rotative stepper motor, except that the parameter “Number of pole pairs” is replaced by “Pole pitch”, and for servo-operation, power constants and motor load are needed instead of torque constants and moment of inertia.

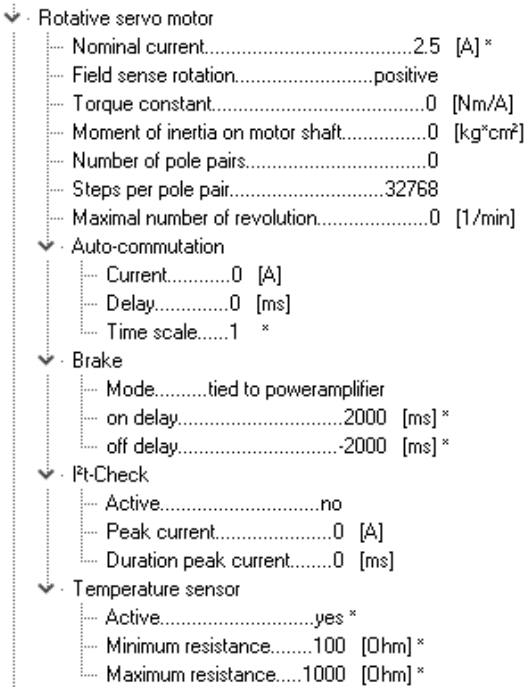
The pole pitch is the distance between two adjacent poles.

Pole pitch

These values are not needed for stepper motor operation.

Power constant
Calculated motor load

3.2.4 Rotative Servo Motor



The adjustable values are the same as those for the rotative stepper motor, except that the torque constant and the moment of inertia on the motor shaft values are now used for configuring the control parameters. An I²t check is also available for Servo operation.

If the motor is operated as a servo, the torque and the moment of inertia on the motor shaft must be known. You can get these values from the motor or axis manufacturer.

Torque constant
Moment of inertia on motor shaft

Via this branch the user can select the motor current during autocommutation, the delay before autocommutation is started and the speed during autocommutation.

Auto-commutation

This branch only exists when Servo has been selected in the setting option Servo/Stepper.

I²t-Check

If the I²t check function has been activated, a servomotor can be operated at a higher current than the nominal current for a defined period of time. Higher accelerations are thus possible for brief periods.

Active

The peak current defines the maximum current at which the servomotor is operated when I²t is active.

Peak current

Duration peak current defines the duration for which a servomotor is operated at the I²t peak current. If the peak current duration is exceeded, the power amplifier switches off.

Duration peak current

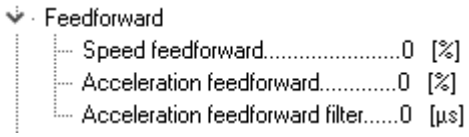
3.2.5 Linear Servo Motor

The adjustable values are the same as those for the linear stepper motor. The power constant and motor load values are now used to configure the control parameters. Here again, an I²t check is available.

The power constant and motor load values can be obtained from the manufacturer of the motor or of the axis.

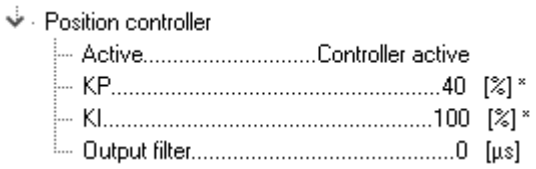
Power constant
Motor load

3.2.6 Controller – Feedforward



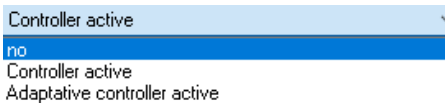
For servomotors, feedforwards can be specified as a percentage. They override the individual control stages. For more information about the feedforwards, refer to the LSTEPexpress documentation.

3.2.7 Controller – Position Controllers

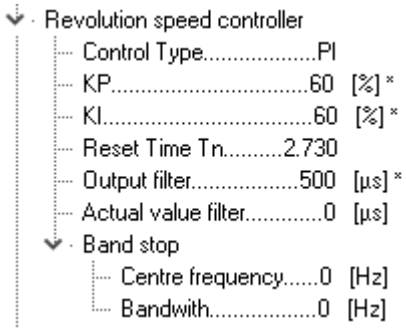


In the "Position controller" branch, WIN-Commander provides two position controllers for stepper motors. The standard position controller behaves the same over the entire speed range. Kp, Ki and an output filter can be entered as the control parameters.
The adaptative position controller changes the control parameters along with the speed. Two sets of control parameters and the corresponding nominal speeds can be entered for this purpose.
For servomotors, the standard position controllers without KI and the speed controller are used.
For more information about the position controller, refer to the LSTEPexpress documentation.

Active

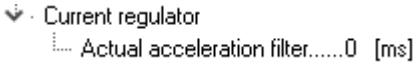


3.2.8 Controller – Revolution Speed Controller



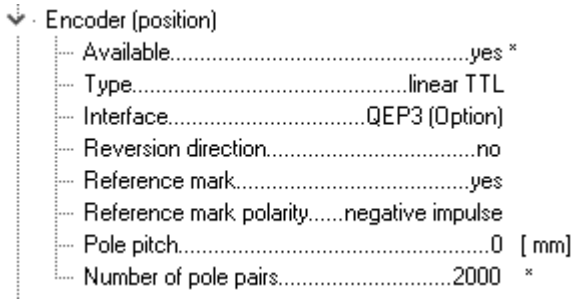
Speed controllers are used with servomotors.
For more information about speed controllers, refer to the LSTEPexpress documentation.

3.2.9 Controller – Current regulator



The current regulator is set automatically by the controller. In the control settings, it is only possible to activate a filter that reduces jumps in acceleration.

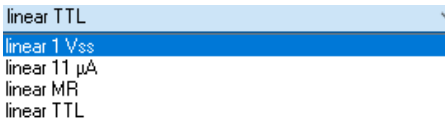
3.2.10 Encoder (position)



To detect or avoid a step offset, the axis can be equipped with an incremental rotary or linear encoder system. If the axis is equipped with an encoder, the parameter "Available" must be set to "yes".

Type

Before being put into initial operation, the encoder must be set properly.
Four basic types of encoders are available:

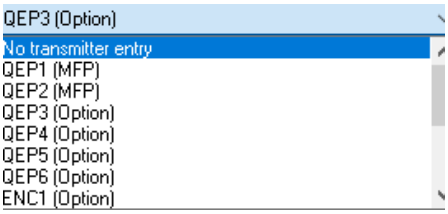


Sine-cosine encoder 1Vss,
11µA encoder (e.g. Haidenhain),
Magneto-resistive encoder,
TTL encoder.

All four types may be rotative at the motor end, linear and rotative at the output end.

Interface

The encoder inputs must be set prior to initial operation.
QEP1 and **QEP2**. These inputs are available with the multi-function port. As a trackball or another device can be interpreted via these inputs, these devices are mutually exclusive. **QEP1** and **QEP2** must additionally be configured under "Hardware configuration".
QEP3 through **QEP6** are TTL encoder inputs. They are only available on double-sided PCBs.
ENC1 through **ENC4** are optional inputs for sine-cosine encoders. They can be retrofitted with an options card.



Reverse direction

If the counter direction is incorrect, it can be reversed by means of a command, without having to turn the encoder or change a phase.

Reference mark

If the measuring system has a reference mark, it can be activated by selecting "yes" here. The controller then references to that reference mark, which results in greater accuracy. If the parameter is set to "no", referencing is done to the switch.

Reference mark polarity

If the measuring system has a reference mark, the polarity of the reference mark can be set here.

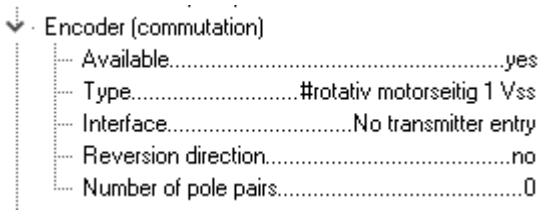
Pole pitch

Input of the graduation for linear encoders, or number of lines per revolution for rotary encoders.

Number of pole pairs

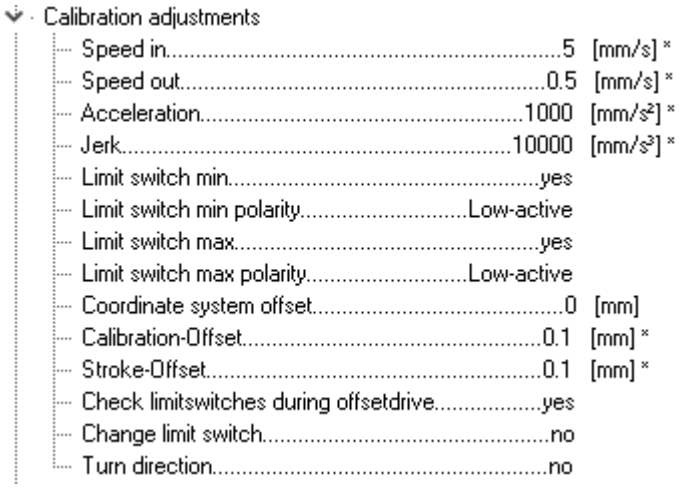
Number of pole pairs per rotation of the encoder.

3.2.11 Encoder (Commutation)



With rotative servomotors, a rotative commutation encoder can be used in addition to the position encoder. The possible settings are the same as those for Encoder (position). The only difference is that the selection of the encoder type has been restricted to rotative encoder and the settings for the reference mark have been removed.

3.2.12 Calibration adjustment



Speed at which movement into the limit switch or out of the limit switch takes place.

Speed in
Speed out

Input of the acceleration.
For a gentler acceleration and gentler deceleration, a jerk can be input.

Acceleration
Jerk

The polarities of the limit switches can be set here, or the limit switches can be deactivated.

Limit switch min.
Limit switch max.

Offset of the coordinate system after the calibration process.

Coordinate system offset

If a calibration offset is input, the axis continues to move by the specified offset after it has left the limit switch.

Calibration Offset

Offset for measurement of the table travel range.

Stroke-Offset

If this parameter is switched off, it is possible to go beyond the limit switch during offset travel.

Check limit switches during offset drive

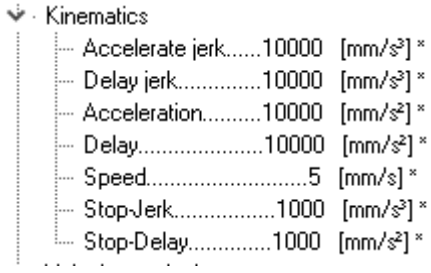
With the parameter "Change limit switch", the min. and max limit switches can be interchanged

Change limit switch

If the "Turn direction" parameter is set to "yes", calibration takes place in the positive direction of travel

Turn direction

3.2.13 Kinematics



Input of the kinematic data for the individual axis. Kinematic data for the motion in the room can be input in the "Kinematics (room)" branch of the controller.

For a gentler acceleration and gentler deceleration, a jerk can be input.

Acceleration jerk
Delay jerk

Input of the acceleration and delay (deceleration).

Acceleration
Delay

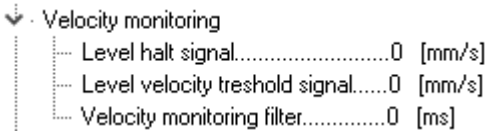
Axis traverse speed.

Speed

Delay behaviour for EMERGENCY Stop. A delay and a jerk can be input here for the event of an EMERGENCY Stop.

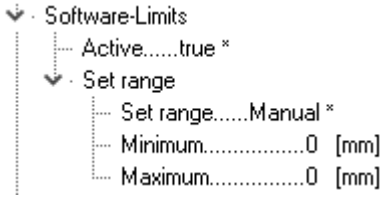
Stop Jerk
Stop Delay

3.2.14 Velocity monitoring



When the speed monitoring feature is enabled, it triggers a digital output when a certain speed value is exceeded or falls below a specified threshold. This digital output can be used to signal an alert, trigger an action, or indicate a specific condition related to the monitored speed value. It provides a way to monitor and respond to speed-related events in the system's operation.

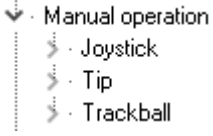
3.2.15 Software-Limits



Software limits can be set to limit the range of travel of the axis. To define software limits, "Active" must be set to "yes". The range can be set either automatically or manually. For the "Manual" setting, two additional parameters are provided for the input of the positions of the software limits. The unit of measure depends on the setting in the parameter "Dimension". If the option "Automatic" is selected, the total travel is measured and the thus determined range of travel is applied as the software limits by means of calibration and measurement of the travel range of the table.

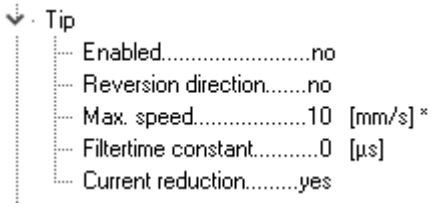
Active
Set range

3.2.16 Manual Operation



The input device can be set up under “Manual operation”. Joystick, Tip (keys), and Trackball are available for selection. As the branches for the input devices are very similar, only the parameters of the “Tip” branch are described below as an example. In addition to these parameters, Joystick has the parameters “Zero window” and “Joystick axis”; Trackball has the additional parameter “Trackball axis”.
Tip mode and Trackball are mutually exclusive as both are interpreted via the inputs QEP1 and QEP2. QEP1 and QEP2 must be configured under “Hardware configuration”.

3.1.1.2 Tip



Tip (or Jog) mode is available when the “Enabled” parameter is set to “yes”.

Enabled

If the parameter “Reversion direction” is set to “yes”, the direction of movement is reversed

Reversion direction

Maximum speed of travel in Tip (Jog) mode.

Max. speed

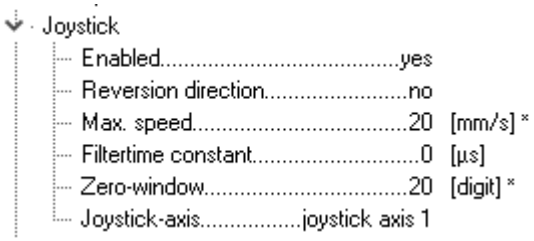
As axis-related acceleration and jerk settings have no effect on the manual control elements, the filter time constant can be used to emulate an acceleration ramp.

Filtertime constant

The current reduction is switched on and off here.

Current reduction

3.1.1.3 Joystick



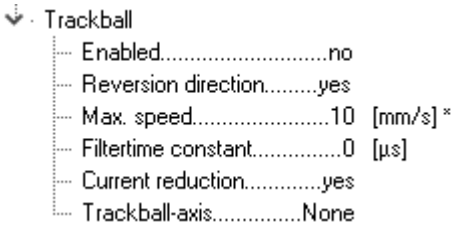
Sensitivity of the joystick. Movements are only initiated when the joystick is deflected beyond the zero window.

Zero window

Any joystick axis can be assigned to the joystick input with this parameter. A joystick axis can also be assigned to two inputs, e.g. for a gantry application.

Joystick axis

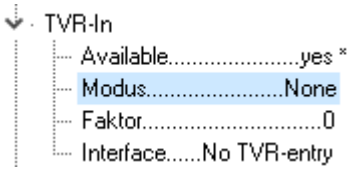
3.1.1.4 Trackball



Trackball axis

The selected trackball axis is assigned to the control axis in whose branch this setting is undertaken. The available choices are the horizontal, the vertical, or no trackball axis.

3.2.16.1 TVR-In



With LSTEPexpress controllers, TVR mode can be used to manually control an axis parallel to the axis travels undertaken by the controller.
Refer to the LSTEP Control Manual for more information.
Three inputs per axis are available on the multi-function port (MFP) for TVR operation.

- Forward/Backward input
  The User must apply the signal for the direction of rotation of the motor here.

- Clock input
  The User must apply the clock signal for axis travel at this input (one pulse is equal to one microstep).

- Start / Stop input
  The enabling signal (tact release) for the clock and forward/backward input must be applied at this input.

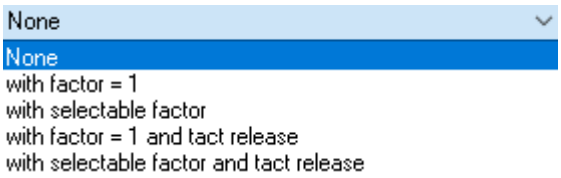
Acceleration ramps are not calculated in TVR mode. Ramps must be set by the User using the clock signals at the motors.

Available

If the parameter "Available" is set to "yes", additional parameters appear.

Mode

There are four modes, which you can select from the list of a combo box.



Refer to the LSTEP Manual.

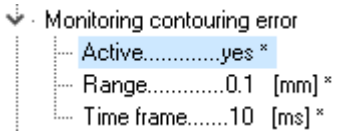
One pulse is equal to one microstep. If you want the axis to travel several microsteps per pulse, a factor, which defines the number of microsteps, can be input here.

Factor

The "Interface" parameter determines whether the axis is to be controlled via QEP1 or QEP2.
As different devices can be interpreted via QEP1 or QEP2, such devices are mutually exclusive QEP1 and QEP2 must be configured under "Hardware configuration".

Interface

3.1.1.5 Monitoring Contouring Error

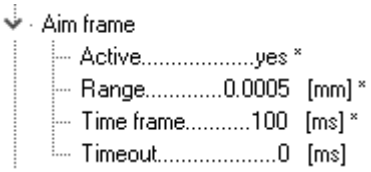


If the parameter "Active" is set to "yes", additional parameters appear. The range and the time frame can be input.

Active
Range
Time frame

On systems with encoders, checks are made while the axis is moving to determine whether the set position and the actual position deviate from each other. If the deviation is greater than the set range and present for longer than the set time frame, the power amplifier is switched off and an error message is output.

3.2.17 Aim Frame



If the parameter "Active" is set to "yes", additional parameters appear. The range and the time frame can be input.

Active

The range defines the size of the time frame.

Range

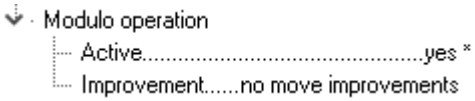
On systems with encoder, the time frame is used to set the length of time that the axis must remain in the time frame until the "position reached" message is output.

Time frame

Timeout

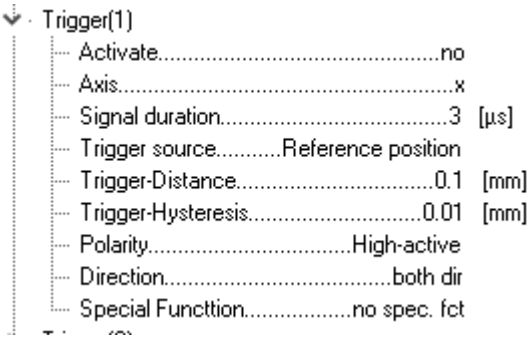
Timeout defines the permitted transient or dwell time within the time frame. If this time is exceeded, an error message is issued. To deactivate this function, set the Timeout value to 0.

3.2.18 Modulo mode



Module axes are axes that are reset to the initial value when the module length is exceeded.

3.2.19 Trigger



A customizable trigger signal can be output at a special output (multi-function port) of the LSTEPexpress controller.

Axis

The trigger signal is always output for one axis only. The trigger axis is set in a combo box.
The trigger signal is only present in the direction of travel along the axis selected here. Only in positive, only in negative, or in positive and negative direction, depending on which trigger mode has been set.

Signal duration

Duration of the trigger pulse.

Trigger-distance

The trigger distance is the distance between trigger pulses.

Polarity

If polarity “High-active” is selected, the ground voltage is 0 volts, and the trigger pulse is 5 volts.

If polarity “Low-active” is selected, the ground voltage is 5 volts, and the trigger pulse is 0 volts.

Direction

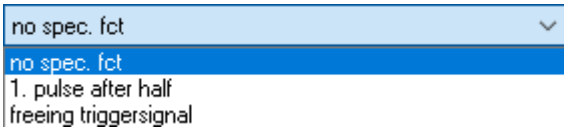
Trigger direction setting.

- Positive direction
  The trigger signal is only present at the trigger output when the selected axis moves in the positive direction of travel.

- Positive/Negative direction
  The trigger signal is present at the trigger output when the selected axis moves both in positive and negative direction.
- Negative direction
  The trigger signal is only present at the trigger output when the selected axis moves in the negative direction of travel.

Special function

In addition to the trigger direction, various modes can also be set for the trigger. These can be selected in the Special Function menu.



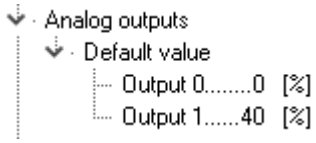
- No special function => Normal trigger mode
- 1. Pulse after half the trigger distance => The first pulse of the trigger signal is output after half of the trigger distance. Each pulse after that is given after one trigger distance length.
- Use external trigger signal => The pulses of the trigger signal are only output at the corresponding, external trigger input when low level is present.

For more information about the trigger, refer to the documentation for the controller.

Trigger Hysteresis

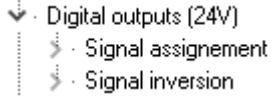
The trigger hysteresis is needed when triggering is done on the measuring system of an axis, in order to supress the noise of the measuring system signal.

3.2.20 Analog outputs

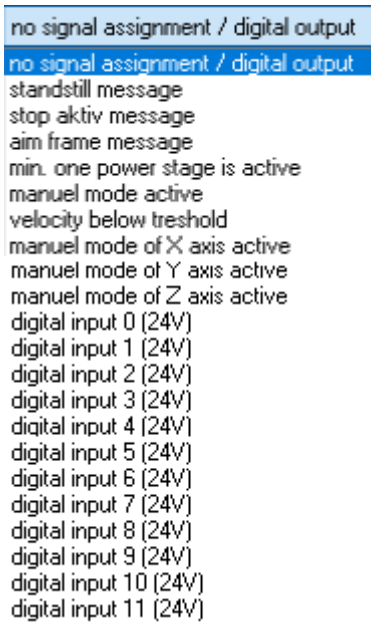


The start values of 2 Analog outputs can be specified in percent via these setting fields.

3.2.21 Digital outputs (24V)

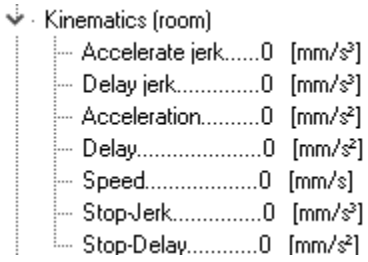


The Digital Outputs settings area is divided into the two sub-items Signal assignment and Signal inversion. Signals can be assigned to all 32 digital outputs in the signal assignment.



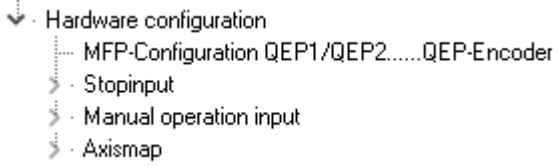
The signals from the figures above can be assigned to the digital outputs.
The signal inversion settings can be used to specify whether these signals should be inverted at the digital output.

3.2.22 Kinematics (room)



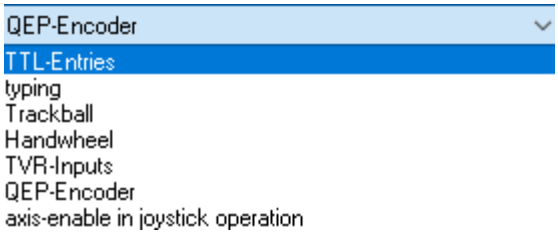
The data for the spatial kinematics can be set under Kinematics (room). The kinematic data for each axis are set with the axis parameters. However, vectors are moved by the controller. The resulting data can be limited by inputting data for the spatial (room) kinematics.

3.2.23 Hardware Configuration

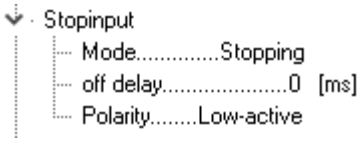


General statements about the hardware used are made in the "Hardware Configuration" branch. The function of pins 20 to 25 of the multi-function port can be defined under MFP configuration.
.

The available configurations are:



In the setting 'Stop input,' you can adjust the mode of the stop input (whether only the motion should be stopped or if the power amplifiers should also be shut down) as well as the polarity of the stop input.



In the 'Manual Operation/Snapshot 2' input, within the positioning controller, you can set the operating mode and polarity of the manual input. In the path controller, you can define the polarity for the second snapshot.
Under Axis Assignment, you can see which letter is assigned to each axis number.

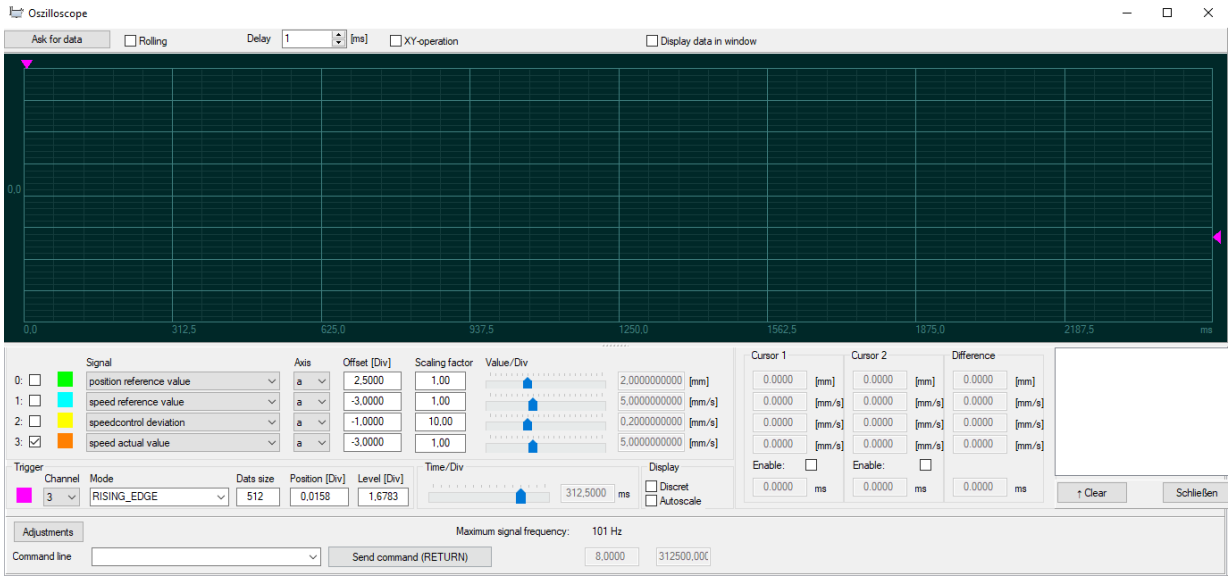
3.3 Export Configuration

Via the menu “Export Configuration”, you can save the parameters that have been entered in the “Configuration” menu to an LSTEP configuration file (*. LSControl). This file can be used by an LSTEP-API application for configuration of the control. The corresponding API commands are LoadConfig and SetControlPars. For more information, refer to the LSTEP-API documentation.

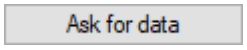
Save Configuration to LStep with this menu, you can save the configuration directly to the connected controller.

3.4 Oscilloscope

An oscilloscope is opened via the menu “Oscilloscope”. It allows various signals from the controller to be displayed visually. 4 channels are available.



Above the oscillogram, there is a button for requesting data. While the request is being processed, you can cancel it by pressing the button again.

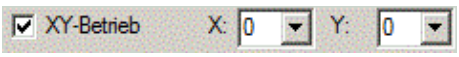


If a checkmark is set in the **Rolling** checkbox, the button is used to start the automatic, cyclic data request. To stop the request, click on the button again.

The status indicator indicates whether data are still being waited for, or whether the data import has finished.

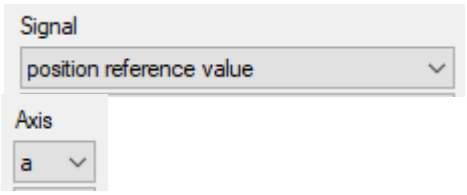
A delay time for the display of the loaded data can be entered in the **Delay** input field.

A checkmark in the **XY-operation** checkbox activates the X-Y presentation. This enables Lissajous figures and characteristic curves to be presented too. The respective channel can be selected from the drop-down boxes **X** and **Y**.

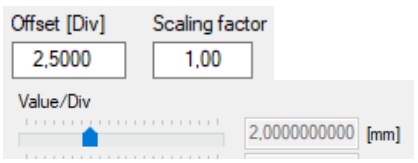


If a checkmark is set in the **Display data in window** checkbox, another window opens when the oscilloscope menu is opened. The data coming from the controller are displayed in this window. They can be highlighted and copied for insertion into other programs, e.g., for additional graphic processing.
Each channel can be activated by setting a checkmark in the checkbox(es) below the oscillogram. Adjacent to the checkbox, a display colour is shown for each channel. Click on the coloured square to open a dialog box for selection of the display colour.

You can select from a variety of signals in the **Signal** drop-down box. The corresponding axis can be selected in the **Axis** drop-down box.

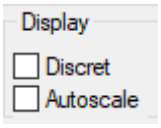


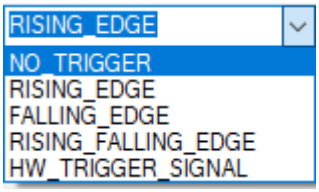
The value range can be set with the slide control **Value/Div.** The sensitivity of the slide control is selected with the **Scaling factor.** In addition, the zero point can be offset in positive or negative direction by inputting an offset into the input field **Offset [Div]**.



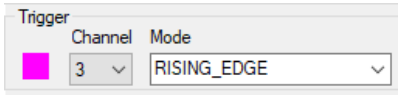
The time base is adjusted with the slide control **Time/Div**.

If the **Discrete** checkmark is set, discrete steps are displayed. If the checkmark is not set, the program lays a curve through the values. If **Autoscale** is activated, the scaling factor and range of values are set for all graphs so that they are displayed.

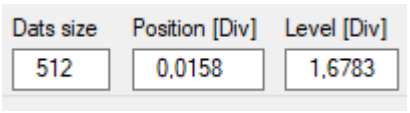




If a trigger event is to take place when a signal is given, the channel with the signal, the colour of the curve and the trigger mode can be selected here. The possible modi can be selected from a drop-down list.



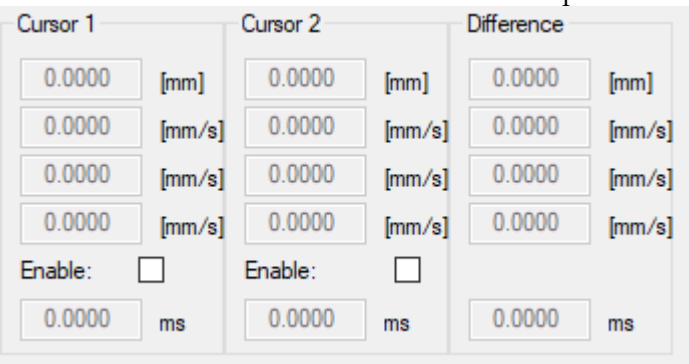
If data are to be displayed before the trigger event, the position on the time axis can be entered in the input field **Position [Div].** The number of data points of a plot can be specified in the input field **Data size**. The trigger level is entered in the input field **Level [Div.]**. This always relates to the zero point of the axis.



The **Adjustments** button opens the "Settings" menu.

To send individual commands to the controller, a command can be entered in the field **Command line** and can then be sent by clicking on the **Send command (RETURN)** button or by pressing the <Return> key. The sent commands are listed in the adjacent display field. The display field can be deleted by clicking on the **←-Clear** button.

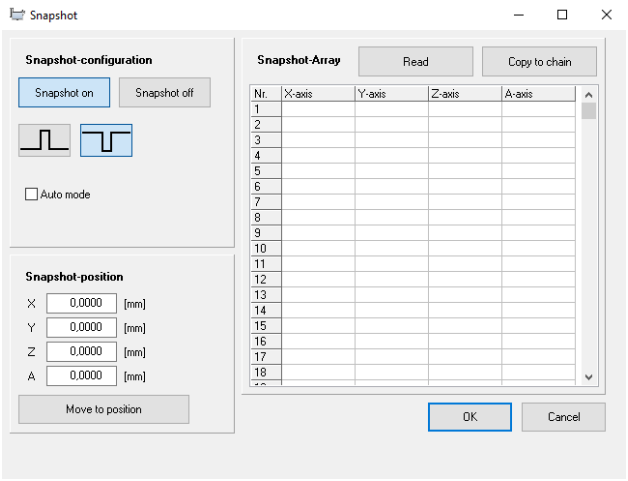
Furthermore, the oscilloscope function also features 2 cursors, which allow precise reading of the values of the measured data and enable the calculation of the difference between 2 data points.



The cursors can be enabled through the checkboxes and then they can be moved to the desired position using the mouse.

3.5 Snapshot

It is possible to save the coordinates of a certain position, controlled by an external signal, during processing. The respective axes can then be moved to that position. LSTEP controllers can receive this signal via the Snapshot input.
Also refer to the LSTEP Manual.

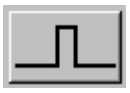


3.5.1 Snapshot On / Off

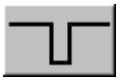
The snapshot signal is activated by clicking on the button **Snapshot on**. The snapshot signal is deactivated by clicking on the button **Snapshot off**.

3.5.2 Polarity

The polarity of the snapshot signal is set with these two buttons.



positive



negative

3.5.3 "Auto mode "

The "Auto mode" function causes the axes to stop immediately after the snapshot and then move to the snapshot position.

3.5.4 Display of the snapshot position

The coordinates that were saved by a "snapshot" are displayed in the X-, Y-, Z- and A- axis fields. If there are multiple snapshots, the last position is shown.

3.5.5 "Move to position "

Since, when auto mode is deactivated, the axes cannot be stopped without a delay, the axes can be moved to the saved snapshot

position (from the last pulse) later. This is done manually, after a snapshot position has been saved, by clicking on the **Move to position** button.

3.5.6 Snapshot Array

The LSTEP can save up to 200 positions in a snapshot array. The array can be read out by clicking on the **Read** button and can be copied to a chain by clicking on the **Copy to chain** button.

3.6 Joystick Configuration

You can configure the key joystick and the Analog joystick in this menu. Refer to Chapter 2.1.11.

3.7 Calibration Settings

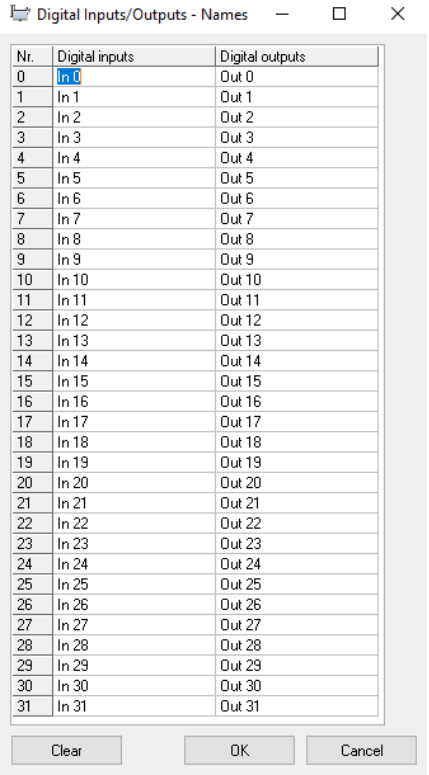
The calibration and range measurement order can be established in this menu. Refer to Chapter 4.1.5

3.8 Function Keys

The function keys **F1-F10** are located below the tabs. The functions and labels of the keys can be set in this menu. Refer to Chapter 2.1.8.

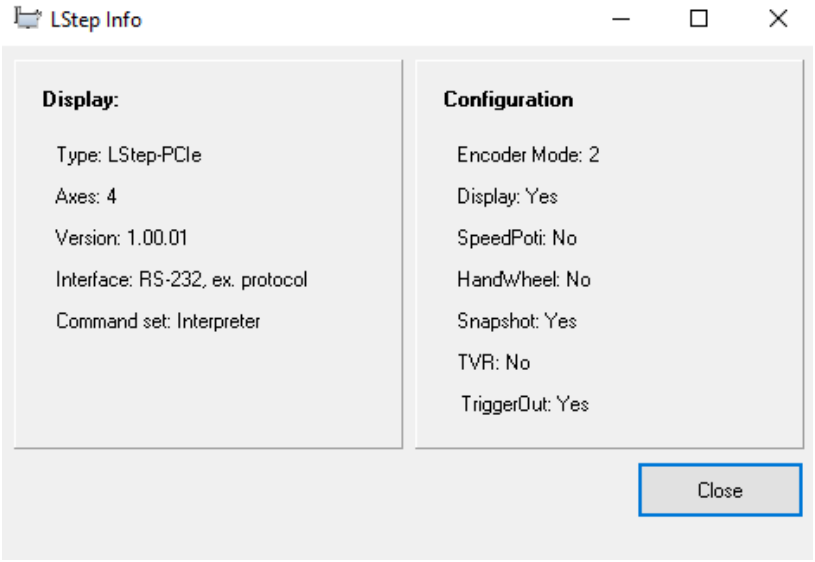
3.9 Digital Inputs- Outputs

Names can be assigned to up to 32 digital inputs and 32 digital outputs in this table. They then appear on the “Inputs/Outputs” tab panel by name instead of by number.



3.10 Info window

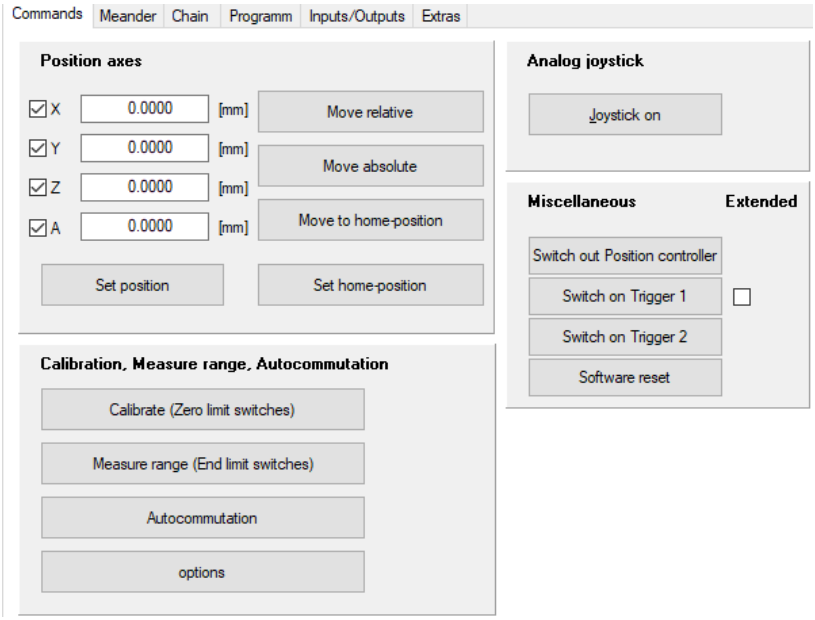
The “Info” menu item opens a window that contains information about the connected controller and its configuration.



4 Commands

4.1 The "Commands" Tab Panel

Various functions can be executed quickly and easily by clicking on the respective buttons on the **Commands** tab panel. The functions are divided up into four groups.



4.1.1 Position axes

In the "Position axes" section of the window, you can move the axes to defined positions. If you click on the button **Move relative**, the axes move from their present positions by the distances defined in the four input fields. If you click on the button **Move absolute,** the axes move to the positions defined in the four input fields. The button **Move to home position** moves the axes to their defined home positions.
If you click on the button **Set position,** the values in the input fields for X, Y, Z and A are taken over for the position at which the axes are presently located. That way, for example, a zero point can be defined at every point within the range of travel. If you click on the button **Set home position,** the position that appears in the position display is taken over as the home position.

4.1.2 Calibrate

When you click on the **Calibrate** button, the table moves to the zero-limit switch and all coordinate values are set to zero. This position is saved as the zero point. If an axis has been deactivated, this command has no effect on that axis.

4.1.3 Measure Range

When you click on the **Measure range (End limit switches)** button, the axes move in the opposite direction to the zero position until they reach the limit switches. This command is used to determine

the maximum permissible range of travel and should only be executed after a calibration process.

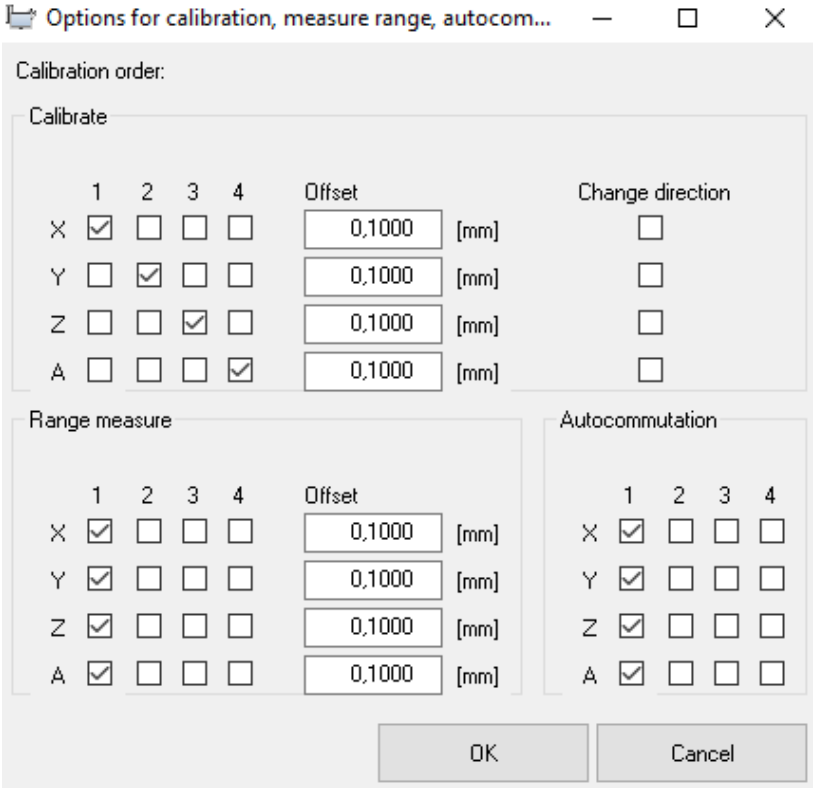
4.1.4 Autocommutation

Click on the **Autocommutation** to switch on the autocommutation function for the axes that have been activated in the „Options "menu; (see Chapter 4.1.5). Autocommutation is only necessary for axes with servomotor.

4.1.5 Options for Calibration, Measure Range, Autocommutation

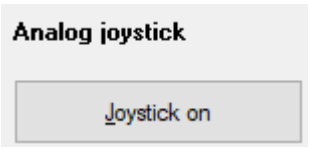
Click with the mouse on the **Options** button to open the "Options for calibration, measure range, autocommutation" screen, in which the order for calibration, range measurement and autocommutation is specified. To prevent a collision with attachments, it may be necessary for the axes to be moved in a certain order. The checkmarks in the respective checkboxes after the axis name determine the order of operations. All axes that have a checkmark in column "1" are calibrated first, then those with a checkmark in column "2", and so on...
An offset can also be entered, by which the axis is moved out of the switch after calibration or after range measurement.
By activating the checkmark **Change direction** in the "Calibrate" box, the calibration direction can be reversed individually for each axis.

In the **Autocommutation** box, those servo-axes must be selected, for which autocommuation has been switched on with the **Autocommutation** button. The values entered for the offsets and direction change are linked in the settings tree with the values in the calibration settings branch for the respective axis.



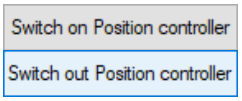
4.1.6 Analog-Joystick

The Analog joystick can be switched on and off by clicking on the **Joystick on** / **Joystick off** button. Settings for the Analog joystick can be made for each axis individually in the "LStep/Configuration menu".



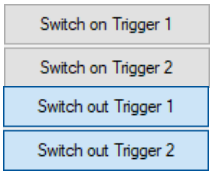
4.1.7 Position controller

You can switch the position controllers on and off by clicking on the **Position controller on** / **Position controller out** button. When **Position controller on** is pressed, the button changes its appearance to "pressed down" and its name changes to **Position controller out**.



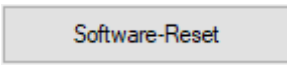
4.1.8 Switch on Trigger

You can switch the trigger on and off by clicking on the **Switch on Trigger/ Switch out Trigger** button. The button then appears pressed down and the name changes **Switch out Trigger**.



4.1.9 Software-Reset

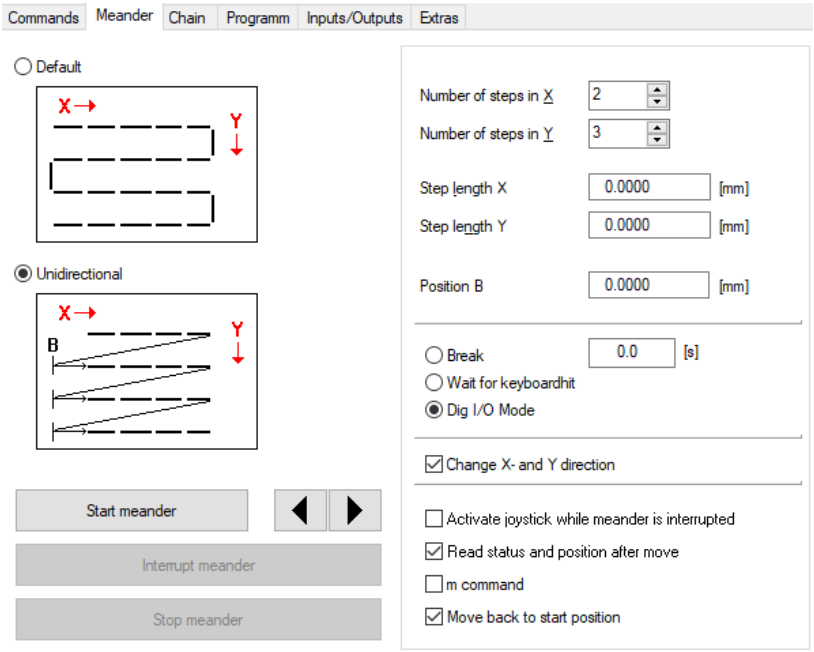
When you click on the **Software reset** button, all options are reset, and the parameters defined in WIN Commander are then transmitted to the controller. The values that were determined by the commands "Calibrate" and "Measure range" are deleted when a software reset is done, i.e. after the software reset, the commands "Calibrate" and „Measure range" must be executed again.
Please refer to the operating manual for the controller for details.



5 The Meander

5.1 The "Meander" Tab Panel

With WIN-Commander, meanders can be created and output very effectively. You can choose between two different types of meander: The default meander, in which the path is travelled bi-directionally and a unidirectional type, in which the path is always travelled in the same X-direction.

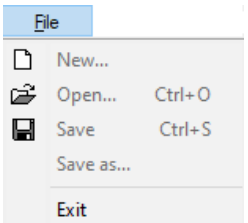


5.1.1 Defining the Meander

The number of steps that are to be travelled in X-direction is defined in the input field **Number of steps in X**. The number of Y-steps that are to be travelled is defined in the input field **Number of steps in Y**. The number of Y-steps defines the number of changes in direction in X-direction. The step size is specified in the input fields **Step length X** and **Step length Y**.
For the unidirectional meander type, a position B can also be specified. After the first path has been travelled in X-direction, the tool is positioned at X= (X starting coordinate – B) and is thereby fed in in Y-direction. The tool is then positioned at the X-starting coordinate and the second path is travelled in X-direction.

5.1.2 Open/ Save Meander

After a meander has been created, it can be saved and then opened again as needed. To save a meander, select the menu item "Save" in the "File" menu, or click on the  icon in the toolbar. The "Save" dialog box opens. You can enter the path and the file name here. The file is saved with the file extension "*.mdr".



To re-load a saved meander, select the menu item “Open” in the “File” menu, or click on the  icon. The “Open” dialog box opens. After selecting the file in question, you can load it by clicking with the mouse on the “Open” button. If any changes are made to the opened meander and the meander is then to be saved again, you can save it with the menu item “Save”. The existing file with the same name is then overwritten. If you want to save the changed meander under a different name, use the menu item “Save as.”.

5.2 Start Meander

When you click with the mouse on the “Start meander” button, WIN-Commander begins to process the meander.
There are additional parameters on the **Meander** tab panel, with which you can determine, how WIN-Commander is to process the meander.

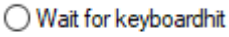
All commands that put the coordinate table into motion can be cancelled immediately at any time by pressing the <Esc> key.

5.2.1 Break

If **Break** is selected, an interval (in seconds) can be set, for the duration of which WIN-Commander dwells at the respective position after every step.

5.2.2 Wait for keyboard hit

If **Wait for keyboard hit** is selected, WIN-Commander stops after every step until you click on the **Forward** (right-pointing arrow) button to give the command to proceed to the next step, or click on the **Back** (left-pointing arrow) to go back a step. The cursor keys on the keyboard can also be used for this purpose.



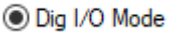
5.2.3 Interrupt Meander

While WIN-Commander is processing a meander, the function can be interrupted at any time for any duration by clicking on the **Interrupt meander** button.
After the button is pressed, the running vector is, however, completed. While the process is interrupted, the name of the button changes to **Continue meander**. To resume the process with WIN-Commander, click in this button again.
The <Space> key can also be used instead of the **Interrupt meander** button.

As soon as the meander has been interrupted, the joystick is active, and any position can be approached. When the meander is resumed, WIN-Commander continues with the meander at the same position at which it was interrupted. The checkbox **Activate joystick while meander is interrupted** must however be activated for this.

5.2.4 Dig I/O Mode

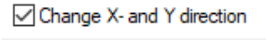
If **Dig I/O Mode** is activated, WIN-Commander waits after every step until the digital I/O input “0” is set briefly by an external device. When the next position is reached, WIN-Commander briefly



sets the digital I/O output “0”. This function permits the LSTEP to be integrated into a system with the WIN-Commander

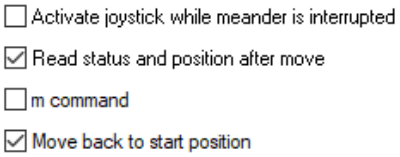
5.2.5 Change X- and Y- Direction

The meander is turned 90° by activating the checkbox Change **X- and Y direction**. The X-axis is the infeed axis.



5.2.6 Activate joystick while meander is interrupted

If this checkbox is activated, the joystick is activated while the meander is interrupted.



5.2.7 Read Status and Position after Move

If this checkbox is activated, the status and the position are inquired after every travel command.

5.2.8 m-Command

If this checkbox is activated, the status and position are not inquired after every travel command.
For some applications, a high speed of travel is required. Every position inquiry and program-internal calculation takes up time and slows down the meander processing operation. The checkbox **m command** switches off all functions that are not necessary and transmits only short, concise commands to the controller. When **m command** is active, the checkboxes **Activate joystick while meander is interrupted** and **Read status and position after move** cannot be activated.

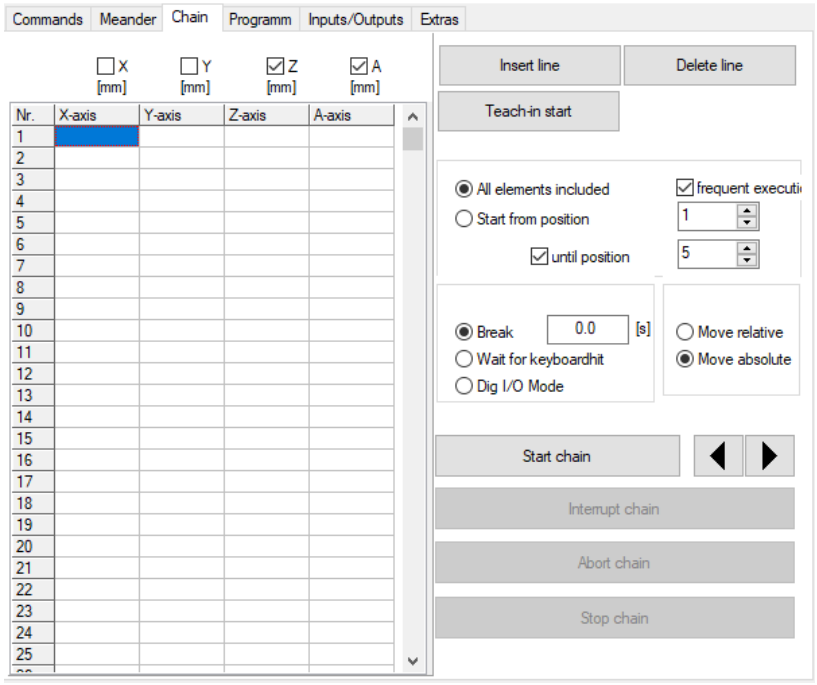
5.2.9 Move Back to Start Position

When the checkbox **Move back to start position** is activated, the axes are returned to the start position after the meander has come to an end.

6 Chain

6.1 The “Chain” Tab Panel

WIN-Commander can save up to 999 positions and move to them in succession. There are three ways of creating a chain.



6.1.1 Write Coordinates in a Table

One option is to enter values for the X-, Y-, Z- and A-axes directly into the cells of the table. When you click in a cell with the mouse, the cursor appears directly in that cell. You can then enter a value. Alternatively, you can press the <Tab> key to move the cursor from one cell to the next. To define a position, all of the cells in a line must be filled with values. For those axes that are not to be moved, a “0” must be entered for relative movement, or the last position that the axis was moved to must be entered for absolute movement. Alternatively, the axes can be deactivated by using the checkboxes located at the top of the Table. If an axis has a checkmark, it is active, and if it doesn't have a checkmark, it is inactive and will not be moved.

6.1.2 Teach-In START (Determine position with joystick)

The second way of creating a chain is to determine a position with the joystick. To do so, click with the mouse on the button **Teach-in start.** The joystick is now active, and you can move to any position. While this process is active, the name of the button changes to **Teach-in stop**. After a position has been set with the joystick, the values of that position are taken over by pressing the <Return> key on the keyboard. To end the process, click with the mouse on the button **Teach-in stop.** A total of 999 positions can be saved.

6.1.3 Create a Chain from Snapshots

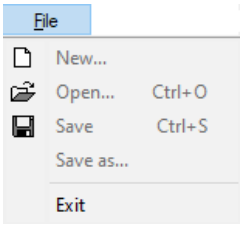
You can also create a chain with the Snapshot function and copy it to the Chain tab panel (see Chapter 3.5).

6.1.4 Insert / Delete Line

Click on the **Insert line** button to insert a new line above the line in which the cursor is located. Click on the button **Delete line** to delete the line in which the cursor is located.

6.1.5 New /Open /Save Chain

After a chain has been created, it can be saved and can be reloaded again whenever needed. To save a chain, select the menu item "Save" in the "File" menu, or click on the  icon in the toolbar. The "Save" dialog box appears. Here, you can enter the path and the file name. The file is saved with the file extension "*.wcc".



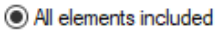
To reload a saved chain, select the menu item "Open" in the "File" menu, or click on the  icon. The "Open" dialog box opens. After you have selected the file in question, you can load it by clicking on the "Open" button. If changes are made to an open chain and this chain is to be saved again, you can do so by selecting the menu item "Save". The existing file with the same name is then overwritten. To save the changed chain under a different file name, use the menu item "Save as...".
If you click on the menu item "New", the contents of the table are deleted, and you can input a new chain.

6.2 Start chain

When you click with the mouse on the **Start chain** button, WIN-Commander begins to process the chain.
The "Chain" tab panel, however, contains some important parameters, with which you define how WIN-Commander is to process the chain. These settings should be made before the chain is started.

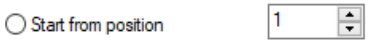
6.2.1 All elements included

If the radio button **All elements included** is activated, the chain is processed from the first to the last position.



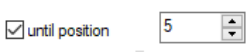
6.2.2 Start from position

If the radio button **Start from position** is activated, the line number, from which the chain is to be started, can be selected in the adjacent input field.



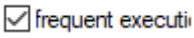
6.2.3 Until position

If the checkbox **until position** is also activated, you can specify the last position that is to be approached within the chain by selecting the appropriate line number from the field adjacent to the checkbox.



6.2.4 Frequent execution

If “frequent execution” is activated, WIN-Commander treats the chain as a loop.
After the last position has been approached, the chain is immediately processed again from the first position.

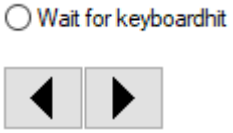


6.2.5 Break

If the **Break** radio button is activated, an interval (in seconds) can be set, for the duration of which, WIN-Commander dwells at the respective position before automatically moving to the next position.

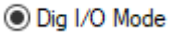
6.2.6 Wait for keyboard hit

If **Wait for keyboard hit** is activated, WIN-Commander stops at a position until you click on the **Forward** (right-pointing arrow) button to give the command to proceed to the next position. If you click on the **Back** (left-pointing arrow) button, the previous position is approached. The cursor keys on the keyboard can also be used for this purpose.



6.2.7 Dig I/O Mode

If **Dig I/O Mode** is activated, WIN-Commander waits after every step until the digital I/O input “0” is set briefly by an external device. When the next position is reached, WIN-Commander briefly sets the digital I/O output “0”. This function permits the LSTEP to be integrated into a system with the WIN-Commander.



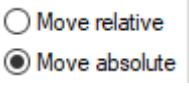
6.2.8 Interrupt chain

While WIN-Commander is processing a chain, the function can be interrupted at any time for any duration by clicking on the **Interrupt chain** button. After the button is pressed, the running vector is, however, completed. While the process is interrupted, the name of the button changes to **Continue chain**. To resume the process with WIN-Commander, click in this button again.
The <Space> key can also be used instead of the **Interrupt chain**.

As soon as the chain has been interrupted, the joystick is active, and any positions can be approached. When the chain is resumed, WIN-Commander continues with the chain at the same position at which it was interrupted.

6.2.9 Move relative

If **Move relative** is active, the position is calculated from the present position. WIN-Commander advances by the value that has been entered.



6.2.10 Move Absolute

If **Move absolute** is active, the position is calculated from the zero point. WIN-Commander moves to that position.

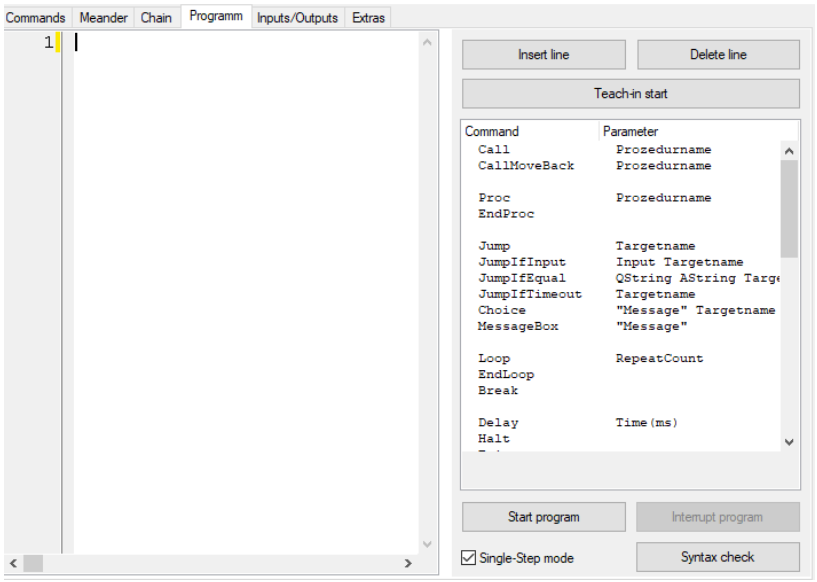
6.2.11 Move directly to individual positions of the chain

To move directly to individual positions of the chain, the cell that contains the line number of the position in question must be activated by double-clicking on it with the mouse. This can only be done if the chain has not been started.

7 Program

7.1 The “Program” Tab Panel

The 4-axis WIN-Commander has a macro language that allows complex contours to be defined and then saved as a program. The programs are interpreted in a module of WIN-Commander and are converted to the corresponding LStep commands.
The left-hand section of the tab panel consists of a text editor for editing the programs. You can protect the writing of programs with a password in the “Options / Passwords for programs” menu.



7.1.1 Creating Programs

You can enter all commands and the corresponding parameters via the keyboard. The tab panel, however, offers you easier options. A table with all available commands is displayed in the right-hand section of the tab panel. Simply click with the mouse on the desired command to insert it in a new line of the text editor. The cursor stops at the end of the line, so that the parameters needed for the command can be entered directly.

7.1.2 Insert /Delete Line

When the cursor is at the end of a line and insert a command from the table by clicking on it with the mouse, the command is inserted into a new line and all subsequent lines move down one place. Another way of doing this is to click on the **Insert line** button. The line is then inserted before the line in which the cursor is located.
A mouse click on the **Delete line** button deletes the line in which the cursor is located.

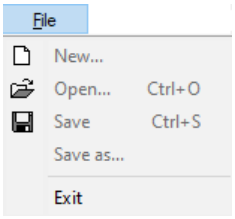
7.1.3 Teach-In START

The button **Teach-in start** is used to determine axis position values with the joystick and insert them into a program as MoveAbs commands. Click on this button to activate teach-in mode. The name of the button then changes to **Teach-in stop**. The Analog or the key joystick is switched on and you can move to the desired position. Press the <Return> key to take over the value. Click on the **Teach-in stop** button to end the process.

7.1.4 Start, Interrupt and Exit Program

The program is executed when you click on the **Start program** button. If there are any syntax errors present, they will be displayed, otherwise the program will be started. The program can be temporarily interrupted by clicking on the **Interrupt program** button. To end the program prematurely, press the <Esc> key.

7.1.5 New /Save /Open Program



After a program has been created, it can be saved and then reloaded at any later time. To save a program, select the menu item “Save” in the “File” menu, or click on the  icon in the toolbar. You can then enter the path and the file name. The file is saved with the file extension “*.wcp”.
To reload a saved program, select the menu item “Open” in the “File” menu, or click on the  icon. The “Open” dialog box appears. After you have selected the file in question, click on the “Open” button with the mouse to load it.

If a password has been entered via the “Options | Passwords for programs” menu, you will be asked for this password when you try to open the file. The program will only be loaded if the valid password is entered.

If changes are made to an open program, and the program is to be saved again, you can do so by selecting the menu item “Save”. The existing file with the same name is then overwritten. To save the changed program under a different file name, use the menu item “Save as...”. If you click on the menu item “New”, the contents of the text editor are deleted, and you can input a new program.

7.2 Commands

7.2.1 Loops and Subroutines

The macro language also supports loops and subroutines (procedures). The keywords “**Loop**” and “**EndLoop**” are used to program loops, whereby the nesting can be any depth.
Procedures are called with the command “**Call**”. The keyword “**Proc**” marks the beginning of a procedure. After the procedure commands, the procedure must be closed with “**EndProc**”. At that point, the execution jumps back to the part of the program that is to be called. Other procedures of the program may also be called within a procedure.

All available commands are described briefly below.

MoveAbs	
Description:	Move to position (absolute)
Parameter:	X Y Z A or Axis position value
Example:	MoveAbs 10.0 20.0 30.0 MoveAbs y 15.0

MoveRel	
Description:	Move to position (relative)
Parameter:	X Y Z A or Axis position value
Example:	MoveRel 10.0 20.0 30.0 MoveRel y 15.0

MoveAbsNoWait	
Description:	Move to position (absolute, asynchronous)
Parameter:	X Y Z A or Axis position value
Example:	MoveAbsNoWait 10 20 30 MoveAbsNoWait y 15

MoveRelNoWait	
Description:	Move to position (relative, asynchronous)
Parameter:	X Y Z A or Axis position value
Example:	MoveRelNoWait 10.0 20.0 30.0 MoveRelNoWait y 15.0

MoveEx	
Description:	Move to position (relative/absolute)
Parameter:	X Y Z A Relative Wait
Example:	MoveEx 10.0 20.0 0.0 0.0 true true

WaitForAxisStop	
Description:	Wait until the axis has reached its destination position
Parameter:	Axis timeout (ms)
Example:	WaitForAxisStop z 1000

WaitForInput	
Description:	Wait until the digital input is active
Parameter:	Input (0..31) Timeout(ms)
Example:	WaitForInput 2 1000

SetOutput	
Description:	Set digital output
Parameter:	Output (0..31)
Example:	SetOutput 0

ClearOutput	
Description:	Clear digital output
Parameter:	Output (0..31)
Example:	ClearOutput 0

Jump	
Description:	Jump

Parameter:	Jump destination
Example:	Jump Adr1 ... Adr1: (Jump destination of any name, followed by a colon)

JumpIfEqual

Description:	Jump if terms are equal
Parameter:	QString AString jump destination
Example:	JumpIfEqual "xxx" "xxx" Adr1 ... Adr1:

JumpIfInput

Description:	Jump when digital input is active
Parameter:	Input (0..31) jump destination
Example:	JumpIfInput 5 Adr1 ... Adr1:

JumpIfTimeout

Description:	Jump if last Wait command has resulted in a timeout
Parameter:	Jump destination
Example:	JumpIfTimeout Adr1 ... Adr1:

Delay

Description:	Delay
Parameter:	Delay(ms)
Example:	Delay 500

Loop	
Description:	Loop
Parameter:	Number of repetitions
Example:	Loop 10 ... EndLoop

EndLoop	
Description:	End of Loop
Parameter:	-
Example:	Loop 10 ... EndLoop

SetVel	
Description:	Set velocity (r/s)
Parameter:	Velocity (same for all axes) or X Y Z A or Axis velocity
Example:	SetVel 10.0 SetVel 10.0 10.0 5.0 SetVel y 10.0

DigIO_InputPolarity	
Description:	Configure the polarity of the digital inputs
Parameter:	Input (0..31) Polarity (0=High-Active, 1=Low-Active)
Example:	DigIO_InputPolarity 5 0 (Input 5 High-Active)

DigIO_EmStopInput	
Description:	Assignment of the Emergency Stop pin
Parameter:	Input (0..31)
Example:	DigIO_EmStopInput 7

DigIO_Distance	
Description:	Activate an output dependent on the set distance before/after the destination / starting position

Parameter:	Output (0..31) Function (0=after starting position. /1=before destination position.) Axis distance
Example:	DigIO_Distance 3 0 5.0 x (Output 3 is to be activated 5 mm after the starting position of the X-axis)

DigIO_Off	
Description:	No manipulation of the inputs/outputs
Parameter:	-
Example:	DigIO_Off

SetDistance	
Description:	Set distance for MoveRelShort
Parameter:	X Y Z A
Example:	SetDistance 10.0 0.0 0.0 0.0

MoveRelShort	
Description:	Move to position (short command, better performance for meandering)
Parameter:	-
Example:	MoveRelShort

Var	
Description:	Define variable
Parameter:	Designator value
Example:	Var test1 10.0

Add	
Description:	Add value to variable
Parameter:	Designator value
Example:	Add test1 1.0

Sub	
Description:	Subtract value from variable
Parameter:	Designator value
Example:	Sub test1 1.0

Mul	
Description:	Multiply variable by value
Parameter:	Designator value
Example:	Mul test1 2.0

Rem	
Description:	Remark or comment
Parameter:	Text
Example:	Rem A comment

SetJoystickOn	
Description:	Switch on Analog joystick
Parameter:	-
Example:	SetJoystickOn

SetJoystickOff	
Description:	Switch off Analog joystick
Parameter:	-
Example:	SetJoystickOff

Break	
Description:	Interrupt program
Parameter:	-
Example:	Break

Choice	
Description:	Message box with choice of Yes/No, conditional jump (if "No" button is clicked on)
Parameter:	"Message" Jump destination
Example:	Choice "HomeMove to position?" adr1 MoveAbs 10 10 0 adr1:

MessageBox	
Description:	Message box with OK button
Parameter:	"Message "
Example:	MessageBox "Test "

Call	
Description:	Call in subroutine (procedure)
Parameter:	Name of procedure
Example:	Call Proc1

Proc	
Description:	Start a subroutine (procedure)
Parameter:	Name of procedure
Example:	Proc Proc1 MoveRel x 10 Loop 5 MoveRel y 1 EndLoop EndProc

EndProc	
Description:	End of a subroutine (procedure)
Parameter:	-
Example:	EndProc

Halt	
Description:	Stop program with an error message
Parameter:	-
Example:	Halt

Exit	
Description:	Close / Exit the program
Parameter:	-
Example:	Exit

CallMoveBack	
Description:	Save the present position, call subroutine, then move back to the saved position
Parameter:	Name o procedure
Example:	CallMoveBack Proc1

UpdateDisplay	
Description:	Refresh the position and status display in WIN-Commander
Parameter:	-
Example:	UpdateDisplay

SetAccel	
Description:	Set acceleration (m/s²)
Parameter:	Acceleration (same for all axes) or X Y Z A or Axis acceleration
Example:	SetAccel 1.0 SetAccel 1.0 1.0 0.5 SetAccel y 1.0

SendString	
Description:	All the controller's ASCII commands (see Chapter 4 of the documentation for the controller) that are not available in the text editor can be sent to the controller with this command
Parameter:	String
Example:	SendString "!trig 1"

Calibrate	
Description:	Moves all activated axes to lower positional values. The travel is stopped as soon as the limit switches are reached. The position value is set to 0.
Parameter:	-
Example:	Calibrate

RMeasure	
Description:	Measure table range of travel
Parameter:	-
Example:	RMeasure

Example Programs

Example 1:

```
MoveAbs 0.0 0.0 0.0          (Move absolute, wait until
                              positioning has come to an end)
MoveRel 1.0 2.0 3.0          (Move relative)
SetOutput 1                  (Set output 1)
Delay 100                    (Delay in ms)
WaitForInput 14              (Wait until input 14 is active)
ClearOutput 1                (Reset output 1))
JumpIfInput 15 Adr1          (Jump to label Adr1 when input 15 is
                              True)
Loop 10                      (Repeat 10x)
    MoveRelNoWait x 7.5      (NoWait -> do not wait for feedback
                              from controller that positioning has
                              been done)
    Delay 50
    SetOutput 3
    WaitForAxisStop x        (Wait until the X-axis is in position)
    ClearOutput 3
EndLoop
Jump Adr1                    (Unconditional jump can sometimes
                              be helpful for skipping parts of the
                              program)
MoveAbs 0.0 0.0 0.0          (never executed)
Adr1:
SetVel y 10.0                (Y-axis 10 R/s)
MoveAbsNoWait y 20.0         (Same as above, but absolute)
DigFunc_InputPolarity 5 0    (Input 5 High-Active)
DigFunc_EmergencyStopInput 7 (Input 7 as Emergency Stop)
DigFunc_Distance 3 0 5.0 x   (Output 3 is activated 5 mm after the
                              starting position of the X-axis)
DigFunc_Off 3                (Function for switching digital input/
                              output 3 off again)
```

Example 2:

```
MoveAbs 0 0 0
Loop 8
      MoveRel z 4
EndLoop
WaitForInput 1 2000
JumpIfTimeout Adr1
Loop 4
      MoveRel y 8
EndLoop
Adr1:
Loop 8
      MoveRel x 6
      MoveRel x -2
EndLoop
Delay 1000
Loop 4
      MoveRel z -4
      Loop 2                    (Loops may be nested)
          MoveRel y -2
      EndLoop
EndLoop
```

8 Inputs / Outputs

The functions on this tab panel are used for test purposes. The inputs and outputs of the controller can be tested here, and control registers can be set and read out for test purposes.

8.1 Digital and Analog Inputs Outputs

8.1.1 Digital Inputs

If a voltage is present at the digital inputs (0-15), the stylized LED for the respective input switches to “red”.
The same applies to the digital inputs (16-31). To view them, click on **16-31** located at the bottom left. Similarly, to go back to viewing the first 16 digital inputs, click on **0-15** at the bottom left.

8.1.2 Digital Outputs

To apply a signal to a digital output (0-15), the checkbox for that output must be activated. The same applies to the digital outputs as for the digital inputs. To access digital outputs 16-31, you need to press the button labelled **16-31** located at the bottom left.

8.1.3 Test Digital Inputs/Outputs

The inputs and outputs are connected with each other with a test connector. The test is started by clicking with the mouse on the button **Test digital inputs/outputs - START**. All outputs are set one after the other. If the hardware is OK, the respective LED always lights up.

8.1.4 Analog Outputs

A voltage can be applied to the Analog outputs. In the input field to the right of the slider, you enter a percentage value that represents the proportion of the maximum applicable voltage. The value can be input either via the keyboard or with the help of the slide control. This voltage is then applied to the respective output when the **Set** button is clicked on.

8.1.5 Analog Inputs

If a voltage is applied to an Analog input, it will be displayed in the output fields of the respective input. The value of the voltage will be shown in the unit of volts (V).

8.1.6 Limit switch

The limit switches, when triggered by motion, activate a "red" LED. For each axis, there are two limit switches: the "Min" (minimum) and "Max" (maximum) limit switches.

8.1.7 Additional displays

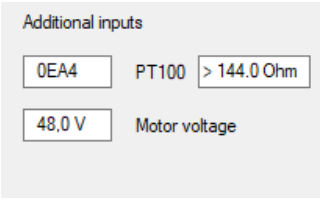
Furthermore, this tab displays whether the stop status is active, whether the manual mode is active, and whether the snapshot status is active. Additionally, it shows the status of the 5 TTL inputs.

8.1.8 Additional Inputs

Interface for temperature sensor PT100.
The measuring range with the PT100 sensor is 0°C to 115°C.
The transmission function is:

$$ADC_{VALUE} = 4095Bit\frac{11(R_{PT100} - 100\Omega)}{612\Omega}$$

The scale is approx. 28,5 Bit/°C.

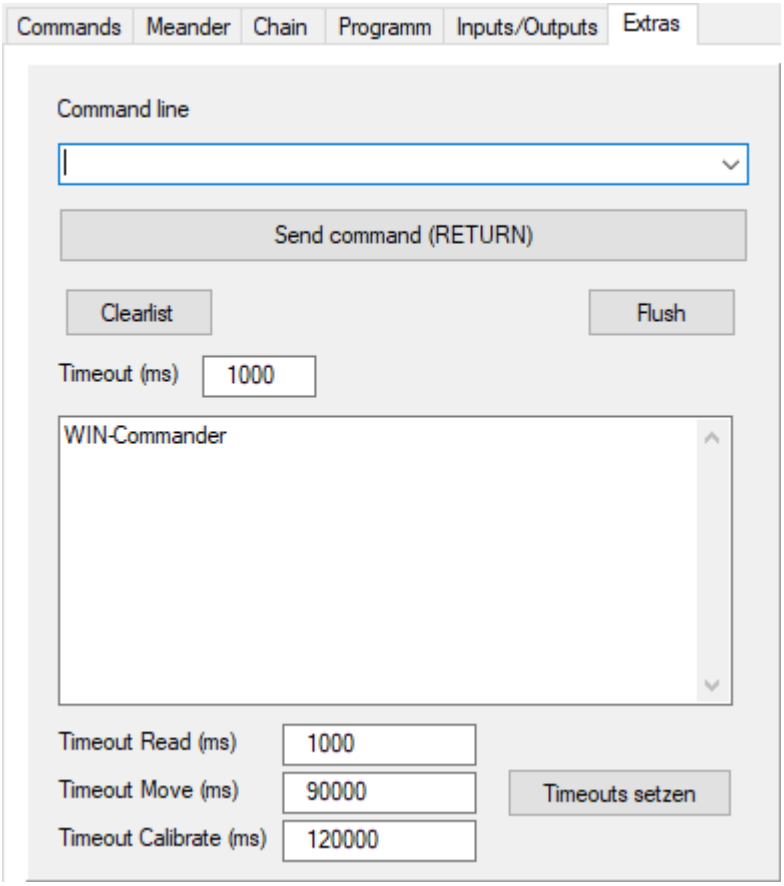


The motor voltage is displayed in volts. On this display, you can check, for example, what motor voltage is available.

9 Extras

9.1 The “Extras” Tab Panel

The tab panel enables individual commands to be sent to the controller.
This module is intended for service purposes. For example, all limit switches can be polled with the command ?readsw.



The command is entered in the Command line. The Command line is a drop down box. If other commands have already been input and executed, they are available in the drop-down list and can be selected from that list. The command is sent to the controller and is executed by clicking with the mouse on the button **Send command (RETURN)**. The commands and position readouts are logged in the bottom section of the window. You can delete this log by clicking with the mouse on the **Clearlist** button. A mouse click on the "FLUSH" button clears the receive buffer. It is recommended to flush the buffer if the protocol loses its synchronization. In the **Timeout (ms)** input field, you can define a time after which the command is aborted if problems have occurred in its execution. It is possible to set different timeouts for various types of commands using the input fields: 'Timeout Read (ms),' 'Timeout Move (ms),' and 'Timeout Calibrate (ms).' Once the 'Set Timeouts' button is clicked, these timeouts become active. This

feature allows for customizing response times for specific commands, offering enhanced flexibility and control over the system's behaviour.

For commands that send feedback upon completion, such as Move commands, **if** the feedback is not displayed in the protocol, the input buffer needs to be cleared using the "Flush" button. This ensures that any potential lingering or unprocessed data in the buffer is removed, allowing for proper reception and handling of subsequent feedback or data.