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# iQ-Drive

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User Manual

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# 1 INSTALLATION

Choose the proper installer (32 or 64 bit) for your Windows operating system and run it. During installation drivers and additional software is installed. The software installations include:

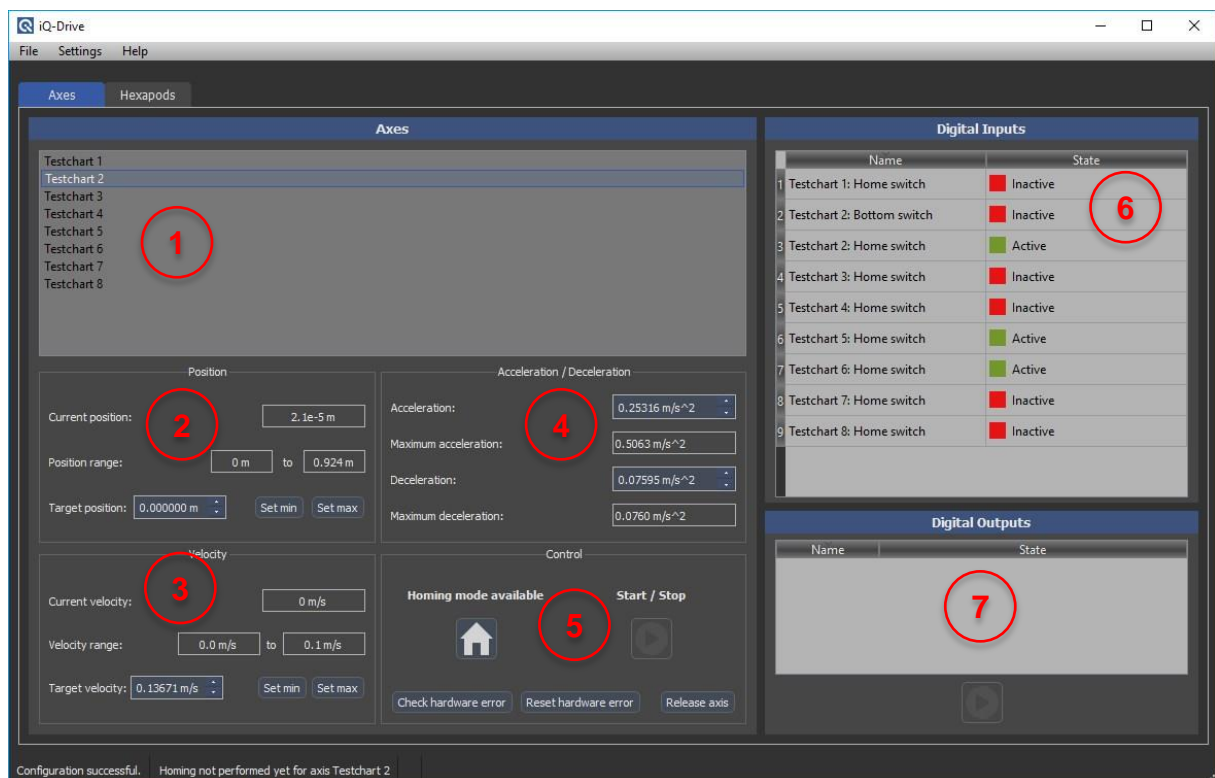
- Microsoft Visual C++ Redistributable
- Device drivers

After installation the program folder contains the following directories:

- *API*: The API files (bin, lib and include sub-directories).
- *Documentation*: A PDF document and HTML files containing the documentation for the iQ-Drive API.

# 2 SOFTWARE DESCRIPTION

The iQ-Drive software is a convenient test program for the iQ-Drive API. The program enables the owner of a motor-driven Image Engineering device, such as the lightSTUDIO with moving target option or a motor-driven camera test stand, as well as hexapod devices for e.g. camera alignment, to operate these with basic functionality. For each motor-driven device and hexapod a set of XML configuration file is available, which must be loaded first in order to initialize the device. The GUI is divided into two parts, one tab is for axes (motor-driven devices) and one for hexapods.





## 2.1 AXES

The axes view includes one control panel for the axes (1-5), one for the digital inputs (6) and one for the digital outputs (7).

To get started load the main configuration file (IE\_Drive\_Configuration.xml) of the XML files set for your device. **The device must be connected to the PC previously since the software tries to establish a connection to the controller simultaneously.**

If an error occurs a message is displayed in the status bar. Possible causes for failed launch may be manipulated XML files, a connected device with different serial number or a true hardware problem. Read chapter 2.1.4 for further information. If configuration was successful, all relevant parameters from the XML files are displayed. All editable input fields and buttons are marked blue, other show only information from XML configuration which can not be changed.

In the Axes area all available axes are displayed in a list view (1). Clicking an axis loads all corresponding parameters in panels 2-5 **and activates only this one for operation.**

### 2.1.1 POSITION PARAMETERS

In panel 2 the current position, the position range and the target position are displayed. The current position is updated during a movement. The position range may have different values depending on the safety mode (see chapter [Safety mode](#)). In the edit field for the target position a position value can be entered, which can not exceed the allowed position range. The default value from the XML configuration denotes a reasonable one for your device.

The unit of the position depends on the type of axis, it may be meter or degree.

Use buttons “Set min” and “Set max” to use the boundary values of the range as target position.

The number of decimal places that is accepted by the edit field depends on the precision of the motor of an axis.

**Please note that the precision of the motor does not reflect the final precision of the axis, since clearance and traction of utilized gear and of some other attached components may add some more inaccuracy. For iQ-Bench and iQ-Chartmount the precision is generally  $\pm 1\text{mm}$ .**

### 2.1.2 VELOCITY PARAMETERS

In panel 3 the current measured velocity, the velocity range and the target velocity are displayed. The current velocity is updated during a movement. The default value for the target velocity can be changed in the boundaries of the velocity range. A reasonable value is used at program start-up.

The unit of the velocity depends on the type of axis, it may be m/s, degree/s or revolutions per minute (RPM).

Use buttons “Set min” and “Set max” to use the boundary values of the range as target velocity

Concerning the number of decimal places the description in chapter [Position Parameters](#) also applies here.



### 2.1.3 ACCELERATION / DECELERATION PARAMETERS

In panel 4 the acceleration and deceleration values can be edited. The maximum allowed values can not be exceeded.

The unit of acceleration and deceleration depends on the type of axis, it may be  $\text{m/s}^2$ ,  $\text{degree/s}^2$  or revolutions per minute/s (RPM/s).

Concerning the number of decimal places the description in chapter [Position Parameters](#) also applies here.

The slopes for the acceleration and deceleration are generally sine-shaped for a smooth movement.

Thus the acceleration and deceleration values denote a mean value for these movement stages.

Between acceleration and deceleration stages the velocity is kept as constant as possible.

**Note:** Very low acceleration and deceleration values in combination with short movement distances may lead to a movement, which does not reach the target velocity.

### 2.1.4 AXES CONTROL / ERROR HANDLING



The control panel is used for homing functionality, start/stop of movement and error handling.

Axes which have a homing functionality, are provided with a homing switch, which is placed at a position along the movement path and is connected to a digital input. Before such an axis can be operated, this homing process must be performed (1). During the homing process no inputs to UI are possible. After homing has finished successfully the Start/Stop is activated. Click the start/stop button (2) to move the selected axis to the target position with the provided movement parameters. If an error occurs during homing procedure the software will return to normal UI behaviour after a timeout as specified in the XML configuration.

Click the “Check hardware error” button (3) for retrieving information with error code and message.

Please contact the Image Engineering support for solving this problem. After the issue is fixed, the hardware controller can be reset to working state by clicking “Reset hardware error” (4).

If you want to move the target axis manually, for example an iQ-Bench, you can release it by clicking “Release axis” (5).



## 2.2 DIGITAL INPUTS

The digital inputs may be connected with different kinds of physical devices, but in general mechanical or electrical switches are used. These switches are in most cases positioned at end positions of axes. In the user interface the inputs are displayed with their names and current state, they can not be edited.

## 2.3 DIGITAL OUTPUTS

Digital outputs can be connected with different kinds of devices, for a example a iQ-Trigger. Select a digital ouput in the list and click the button in order to change the state of the ouput. Selected outputs are marked blue.

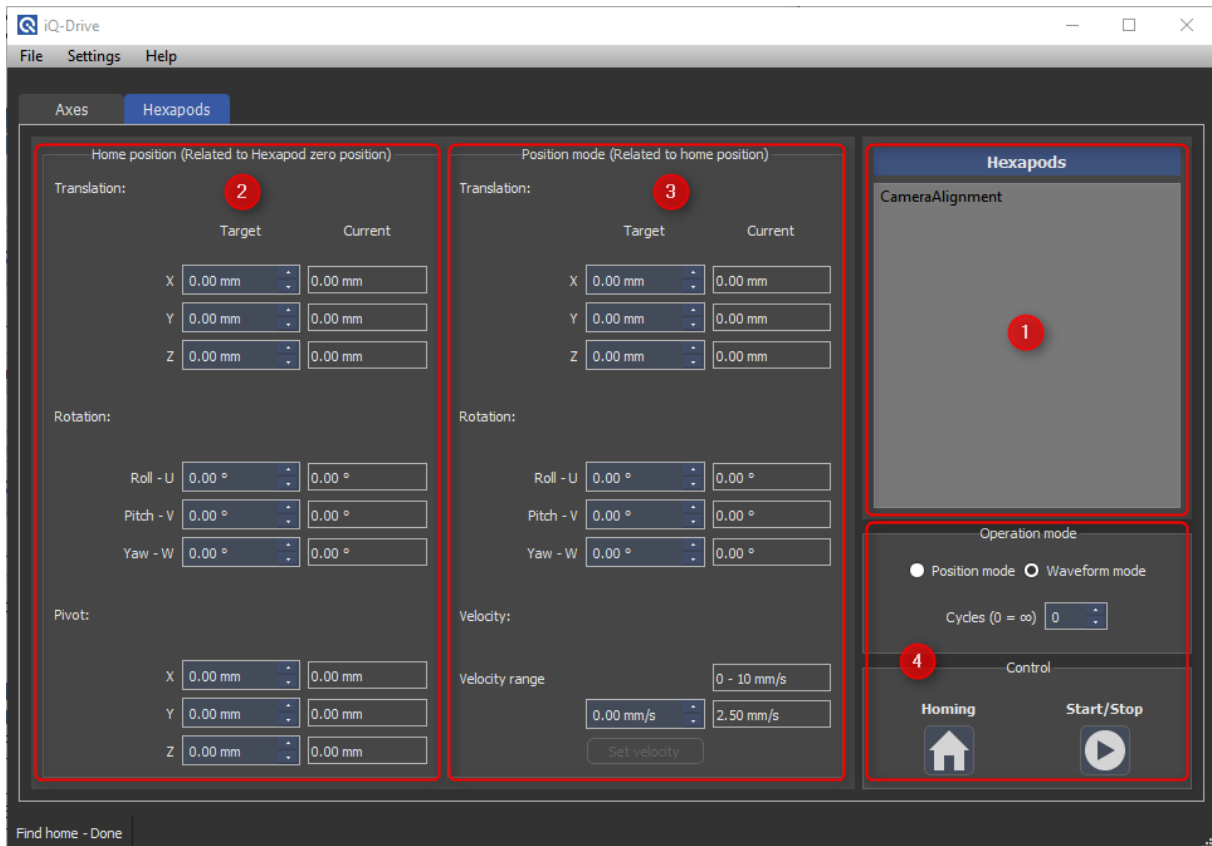
## 2.4 SAFETY MODE

Depending on the setup of your motor-driven device some axes may collide in dedicated position ranges, generally at the ends of a guide rail. Therefore the iQ-Drive API offers two methods for requesting different position ranges, a default one and a safety range. The boundaries of the safety range ensure that axes can never collide and thus damage your device. In the iQ-Drive software the standard setting after loading the configuration file is the safety mode. When disabling the safety mode in the settings menu, the (extended) position range can be used and the corresponding fields are marked red and a warning dialog is displayed. In case there is no safety range available for axes, default and safety range are equal.

**Be aware that leaving the safety mode and moving axes outside the boundaries of the safety range may cause damage to parts of your device.**



## 2.5 HEXAPODS



In the Hexapods area of the GUI all available hexapods are displayed in a list view (1). Clicking on an hexapod loads the corresponding parameters.

### 2.5.1 HOME POSITION

The home position (2) represents the position related to the hexapod zero position. This position is equal to  $XYZ=0$ ,  $UVW=0$ ,  $XYZ\_Pivot=0$ . All movements in position- and waveform mode are related to the user defined home position. It is useful to set the home position as the aligned position to the test chart. It is necessary to click the “Homing” button in section (4) to set a new target home position and pivot point. Please check the hexapod datasheet to get the zero position of the hexapod. This position can be used to measure the new pivot point e.g. for a rotation in the focal plane. The “Current” (2) position for all axes were updated after the homing is finished. Please check the status bar at the bottom if an error occurs.

### 2.5.2 POSITION MODE

The position mode moves an axis to a target position. The position for all axis are related to the homing position (2). After changing the target position please select in the “Operation mode” box (4) to “Position mode” and click the “Start/Stop” button to move to the target position. All “Current” (3) positions were updated after the target position is reached. To change the velocity of the moving



platform define a new target velocity in a range of the “Velocity range” and click the “Set velocity” button. Please check the status bar at the bottom if an error occurs.

### 2.5.3 WAVEFORM MODE

To perform a waveform with one or multiply axes movements navigate in the menu bar to “File” and select “Open waveform file...”. An example waveform file is available in the installing folder of the API. Navigate to ../Documentation/ and select the “iQ-Drive\_HexapodWaveform\_Example.txt”. It is possible to select the waveform cycles after the “Waveform mode” (4) is choosen. To start the movement just click the “Start/Stop” button. Please check the status bar at the bottom if an error occurs. If a position in the waveform is out of range, the hexapod will not perform that waveform.

## 3 XML CONFIGURATION FILES

The XML configuration files are substantial parts for operating a motor-driven device with the iQ-Drive API (and this applies also to the iQ-Drive software). The XML files are individually configured by Image Engineering for each device and should never be edited by the customer.

**Never change the XML files without consulting the Image Engineering support. This may harm your hardware.**

There is one configuration file (IE\_Drive\_Configuration.xml) which needs to be loaded. The XML files are delivered on the USB stick with the software.

## 4 3<sup>RD</sup> PARTY COMPONENTS

The iQ-Drive software uses open source software:

**libusb** ([www.libusb.org](http://www.libusb.org)) is licensed under the GNU Lesser General Public License version 2.1 or later ([www.gnu.org/licenses/old-licenses/lgpl-2.1.html](http://www.gnu.org/licenses/old-licenses/lgpl-2.1.html)).

**Qt** ([www.qt.io](http://www.qt.io)) is licensed under the GNU Lesser General Public License version 3.0 or later ([www.gnu.org/licenses/lgpl-3.0](http://www.gnu.org/licenses/lgpl-3.0)).

**QsLog** (<https://github.com/victronenergy/QsLog>)

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