

# Force control

Force control is possible using integrated drive with some limitation due to the resolution of the current loop. Firmware to be used for a **correct force control is starting from version 5A51**.

## Example of two position application with force control

In order to have one position where a force control take place we need two specify three motion task in the motion controller table, like in the screenshot below.

In this example, position 0 is 10 mn and the position 1 is 52mm where the force control will applied with a force of 8 N with a duration of 1sec.

The screenshot shows the NiLAB Starter software interface. On the left, there's a 'DRIVE STATUS' panel with buttons for 'RUN', 'ON', 'OFF', 'FAULT RESET', 'RESET AUTOMATIC HOMING', and 'MANUAL HOMING'. The main area displays the 'Motion Table' with a table of motion tasks. The table has columns for Index, Motion type, Position, Acceleration time (A), Constant speed time (B), Deceleration time (C), Waiting, and Trigger mode. The tasks are as follows:

Index	Motion type	Position	Acceleration time (A)	Constant speed time (B)	Deceleration time (C)	Waiting	Trigger mode
1793	Triangular	10,000 mm	150 msec	0 msec	150 msec	100 msec	Auto
1804	Triangular	52,000 mm	150 msec	0 msec	150 msec	100 msec	Auto
1815	Force	52,000 mm	1000 msec	-8 N	0 msec	3 msec	Auto
1826	None	0,000 mm	0 msec	0 msec	0 msec	0 msec	
1837	None	0,000 mm	0 msec	0 msec	0 msec	0 msec	

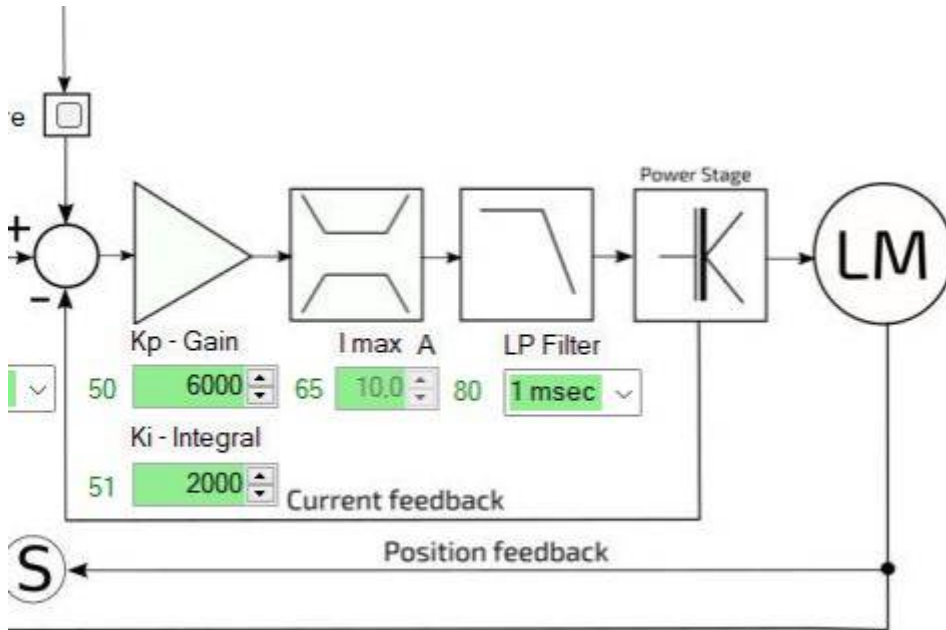
Legend: Value changed and not downloaded (orange), Value downloaded / uploaded correctly (green).

The sign of the force specified in the table must correspond to the direction of the slider, as in this photo.



We suggest to reduce to a minimum the wait time in the task force to avoid overshoot in the position when the force control switch to position control.

In order to have a good response, we suggest to increase Ki integral in current loop.



## Force control performance

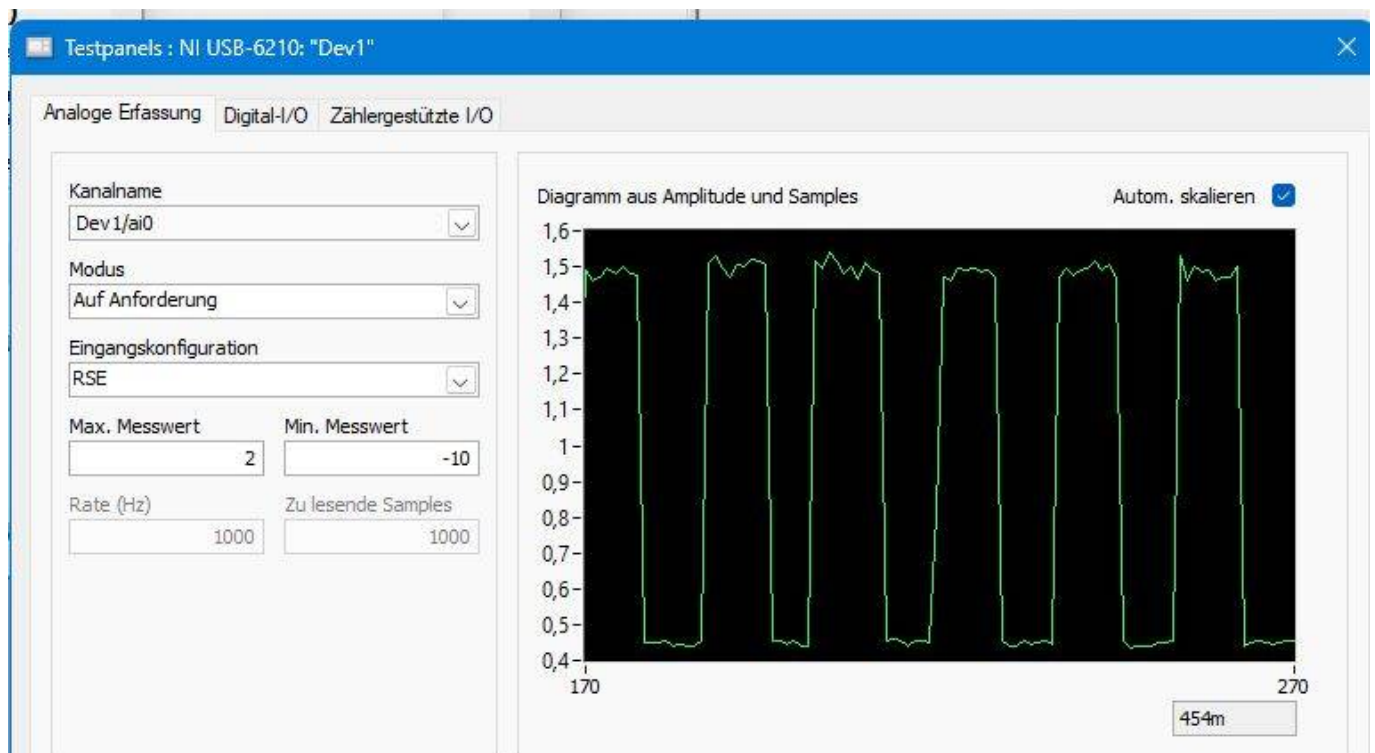
Here below the force measurement variation with the motion table values measured by external load cell.

Load cell: FC2231

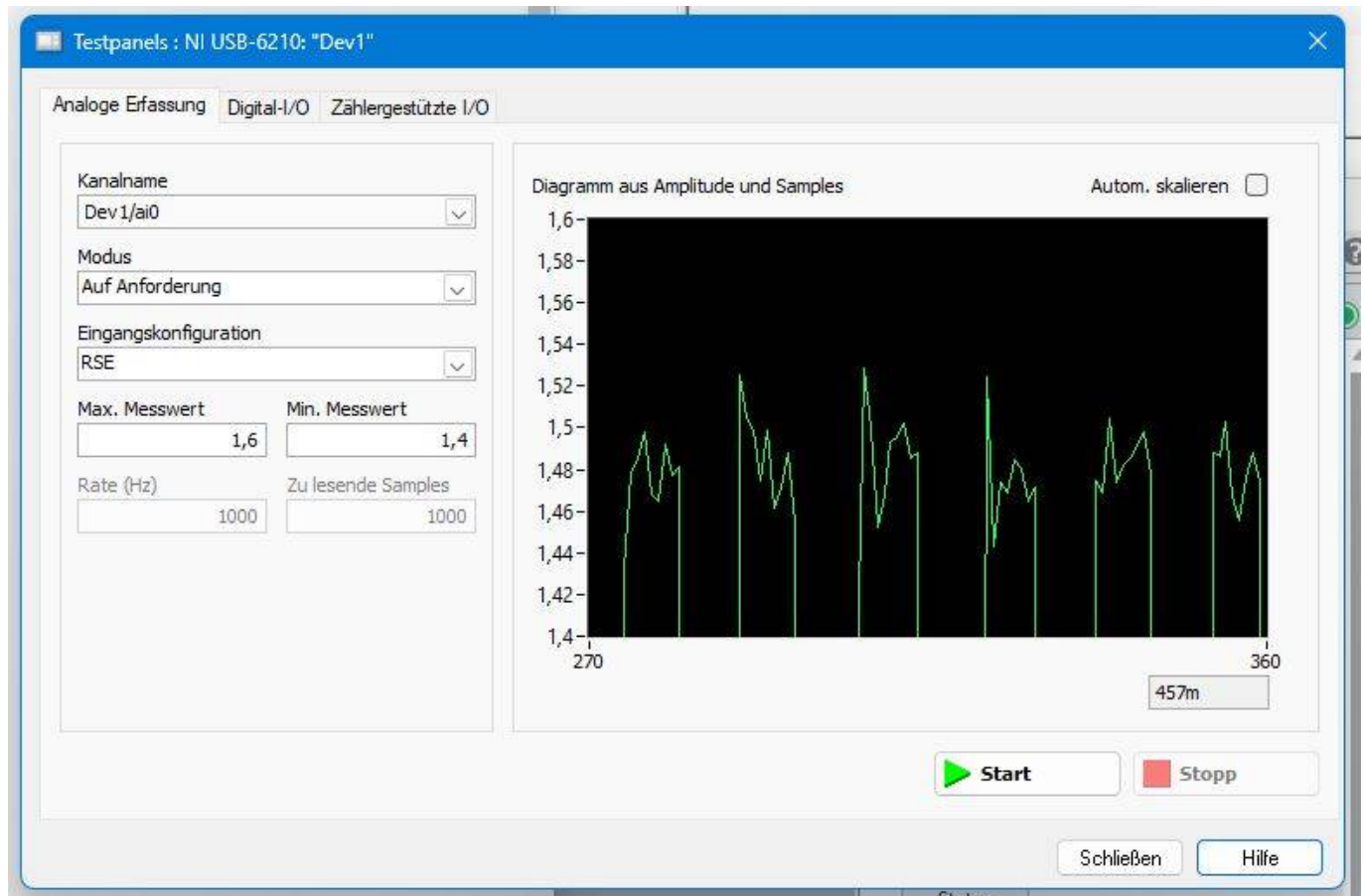
(<https://www.digikey.at/en/products/detail/te-connectivity-measurement-specialties/FC2231-0000-0010-L/809394> )

Acquistition system National Instruments NI USB-6210

(<https://www.ni.com/de-at/shop/model/usb-6210.html>)

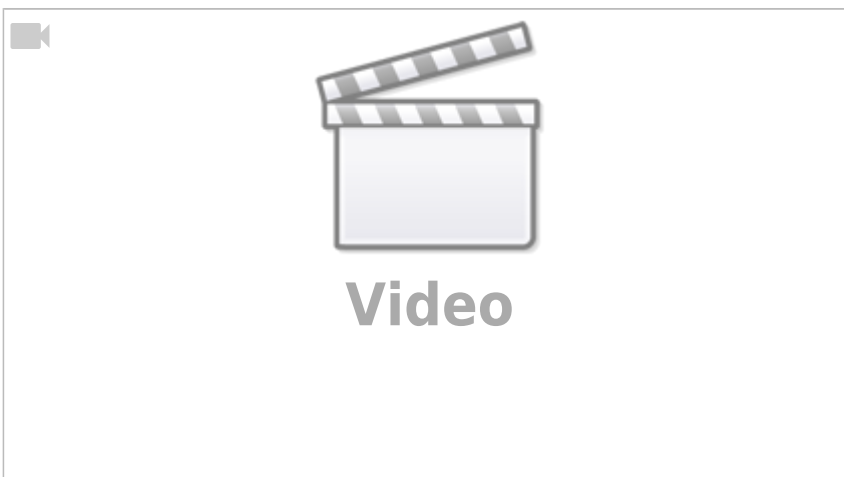


## Force repeatability



Force repeatability is  $1,486 \pm 0,035$  mV. Considering the force coefficient of  $1,63$  V/N we have a force repeatability of  $\pm 0,120$  N.

## Video



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