Manual -
PiSoWorks NV200/D NET

Please read carefully before switching on the power! Please see the safety instructions for using piezoelectric actuators and power supplies!

CE

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1 Introduction

This manual describes the digital piezo amplifier series NV200/D NET from piezosystem jena. You will also find additional information regarding piezoelectric products.

Definition: All systems from piezosystem jena such as electronics, actuators, and optical systems are called “units”.

If you have any problems, please contact the manufacturer of the system: piezosystem jena, Stockholmer Str. 12, 07747 Jena. Phone: +49 36 41 66 88-0

2 Certificate of piezosystem jena

The company piezosystem jena GmbH has worked according to a DIN EN ISO 9001 certified quality management system since 1999. Its effectiveness is verified and proven by periodic audits by the TÜV.

Note: This instruction manual includes important information for using piezo actuators and electronics. Please take the time to read this information. Piezo positioning systems are mechanical systems that offer the highest precision. Correct handling guarantees that this precision will be maintained over a long time.

3 How to use the Service Tool

3.1 Introduction

Service Tool for NV200D/NET can be downloaded from the following link to our website: Piezo system.

The software supports only Windows Operating Systems. Once downloaded all the necessary dependencies will automatically be installed to run the software. The software only supports Ethernet connectivity to the NV200D/NET amplifier directly or indirectly via an ethernet switch or VPN. The IP address of the amplifier is dynamic and can change from time to time since the DHCP server is used. The advantage of the service tool is it will display all the connected NV200D/NET devices in the network and thus make it easier to change between them and update the functionalities.

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3.2 User Control Flow

How to start the software:

- Make sure you have an Ethernet connection to the amplifier.
- Make sure the actuator is attached to the amplifier.
- And lastly, start the software after turning the power of the amplifier on given that all the above statements have already been realized.

If not done in the correct order, the software will raise an exception and either not open or will require a restart.

Upon starting the software for the first time, the user should see the following **Figure** 1.

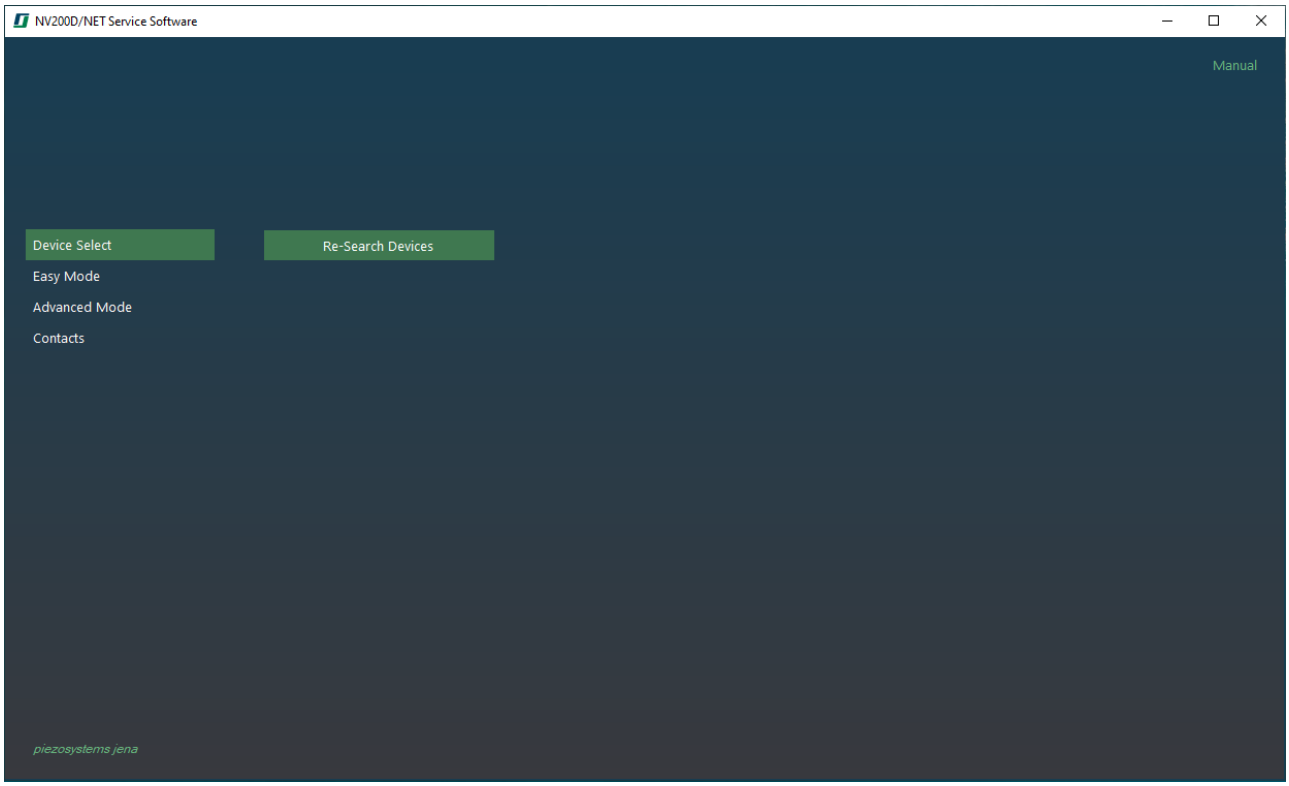

Figure 1 Start View

On the left side of **Figure 1**, the user has access to different buttons that open different types of functionalities to control the amplifier. The order of the buttons is in favour of the user, such that inexperienced users can have the least amount of effort to use the software. Keep in mind that with this software more than one NV200D/NET can be accessed. However, this does not mean all the NV200D/NETs can be controlled simultaneously!

To use the software fully the user must select a device from the network. In this case, no device is displayed and can be redisplayed by pressing **Re-Search Devices** button on the **Device Select** view. **Figure 2** shows the possible outcome of this.

In this case, there is only one NV200D/NET found since only one of them is connected to the network. The second step is to select the desired NV200D/NET, which can be verified by the MAC address or Actuator name. Easiest is the MAC address since it is also printed under the amplifier.

After completing this step, the user can proceed to any other **view.**

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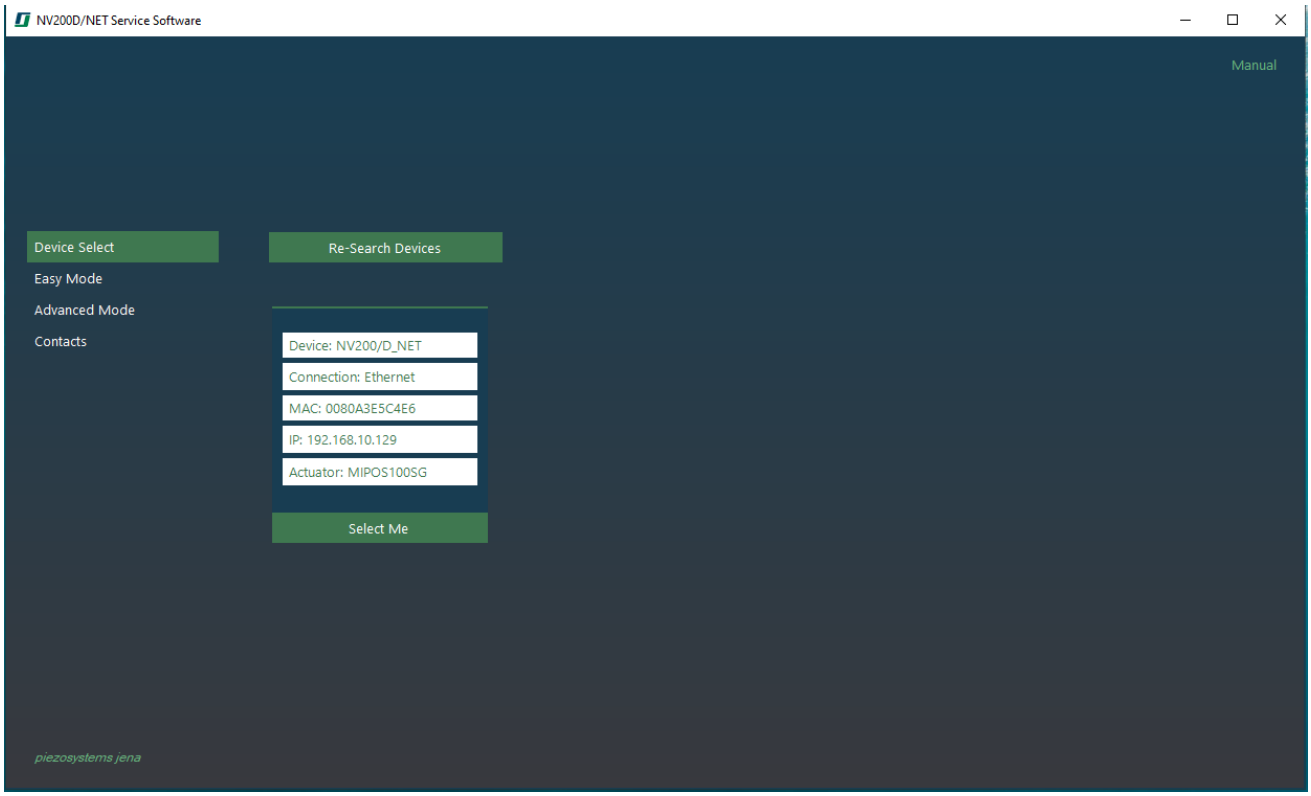

Figure 2 Selecting an Amplifier

3.3 Easy Mode View

This is designed for the user who either wants to do a system setup verification by making a simple step response or someone who does not technically have expertise on our products (**Figure 3**).

To do a simple **Jump:**

- Firstly, check if the system is an open loop or closed loop.
- The loop type can easily be changed by the user.
- The recommended setup is to use the closed loop and enter a valid real number between **postmin** and **posmax** that are displayed below the **Jump** button.
- In this case, 70.0 can be entered, where it stands for *70.0 micrometers (in open loop)*.
- Once **Jump** is pressed depending on the type of actuator connected, amplifier feedback will be plotted automatically.
- The result is shown in **Figure 4**.
- The x-axis shows the time it took the actuator to arrive at the desired set point.
- The y-axis shows the measured set points from the actuator.

When something else not described happens, please refer to the Manual by clicking on the **Manual** button on the top right corner in the Service Tool.

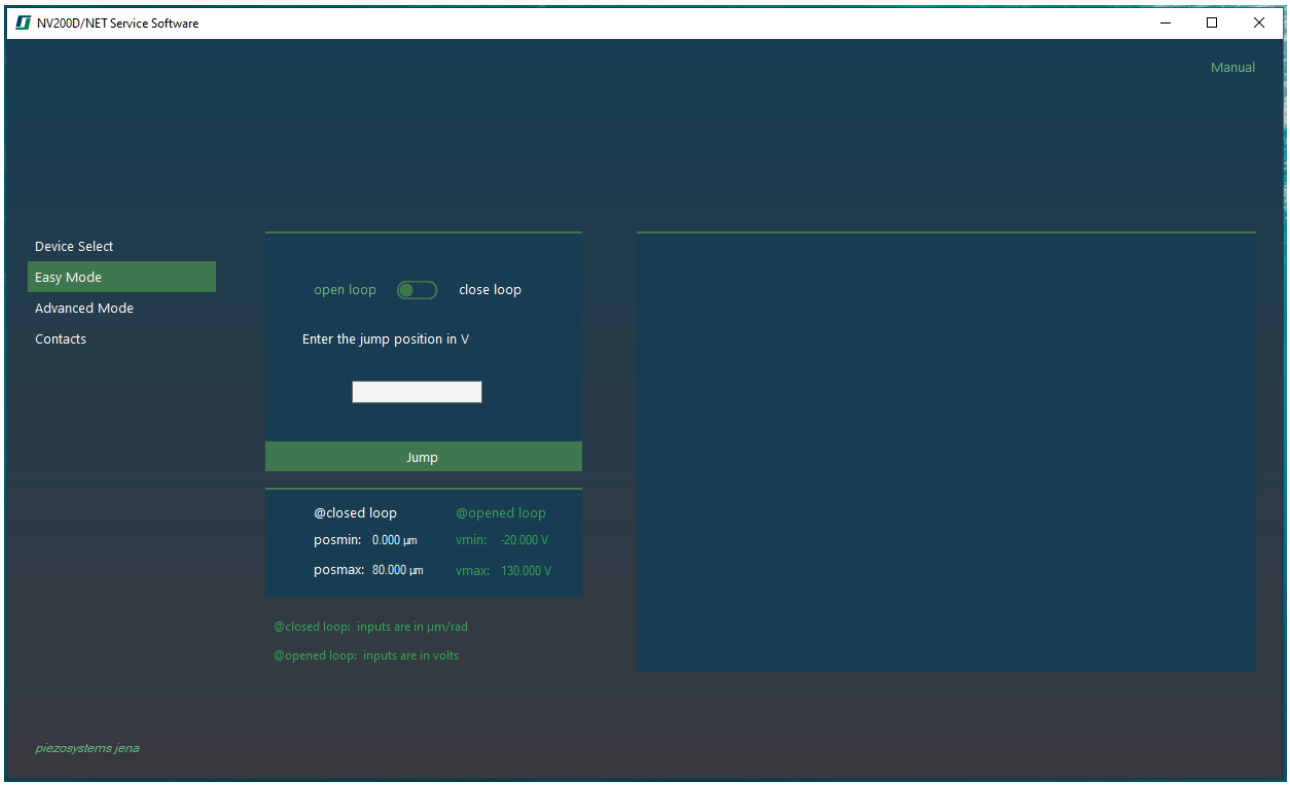

Figure 3 Easy Mode before Jump

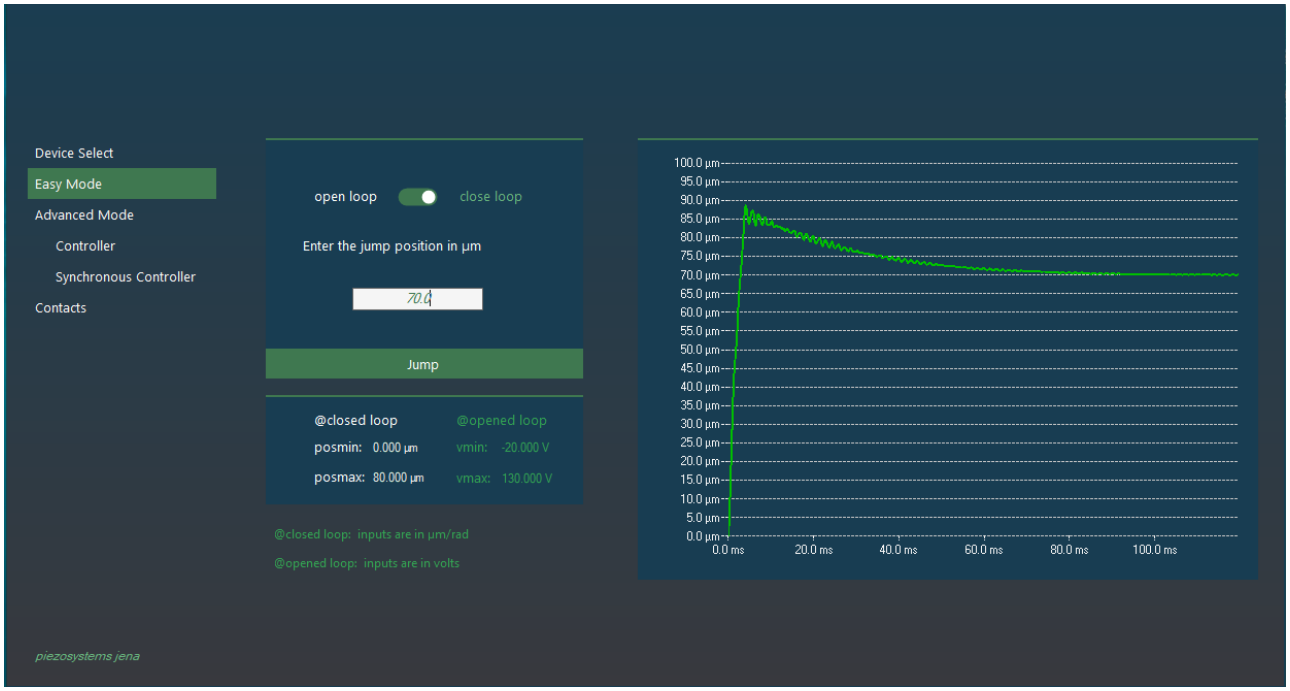

Figure 4 Easy Mode after the Jump

3.4 Advanced Mode - Controller

The controller view has 3 different tabs:

- **Controller**, where the amplifier can be controlled or configured.
- **Device Output**, where the amplifier feedback can be requested.
- **Wave Form Generator**, where any type of waveform can be sent to the device and executed.

3.4.1 Controller Tab

In this view, an interactive control panel of the amplifier is introduced to the user. Before doing anything, it is recommended to start by reading the current states from the amplifier by pressing the **Retrieve Device Parameters** button and updating the control panel in **Figure 5**. **Figure 6** shows the updated version of the control panel after the button press. Keep in mind that this was optional to do and software/hardware works regardless of reading the active values from the amplifier.

To send a new set position, the first **set/setst** commands can be used as stated on the top left of the controller diagram. Only one of these two inputs can work at a time. Recommended is to use the **set** as a beginner. Once the new position value is entered into the **set** command, **Transmit (**on the bottom right of the controller diagram**)** button must be pressed or simply press enter key.

The source of the control of the device can be changed by clicking on the switch and bringing it to the correct position.

When wanted loop controller can be also switched by clicking on it.

KEEP in mind that, every time a new configuration of the **Controller** panel is created or any modification is done, **Transmit** button must be pressed to send the modifications to the amplifier. Otherwise, no new effects will be realized.

Once the parameters that are existing on the **Controller** panel are perfectly matching to application's needs, they can be exported to the text file by clicking the **Export Parameters** button.

Pressing **Get Current Measurement** button will result in to display of the active positional status of the piezo.

To make a **Jump** with a given positional / voltage value write it to the empty place in front of the **set/setst** command. Make sure that **Modulation Source Selector** (the 4-state **switch** is fixed to the 1st connection, in this case, **ETH/USB**). Hovering over the commands also will show a simple example or instruction of the format type the command accepts. To use the **setst** command, also time parameter must be entered. **Example**: 50,0.060. In this example, 50 stands for setpoint (open loop – voltage, close loop – micrometers) whereas 0.060 stands for 60 milliseconds. Do not forget to transmit the changes after the modification by pressing **Transmit** button on the bottom rightmost side of the control diagram.

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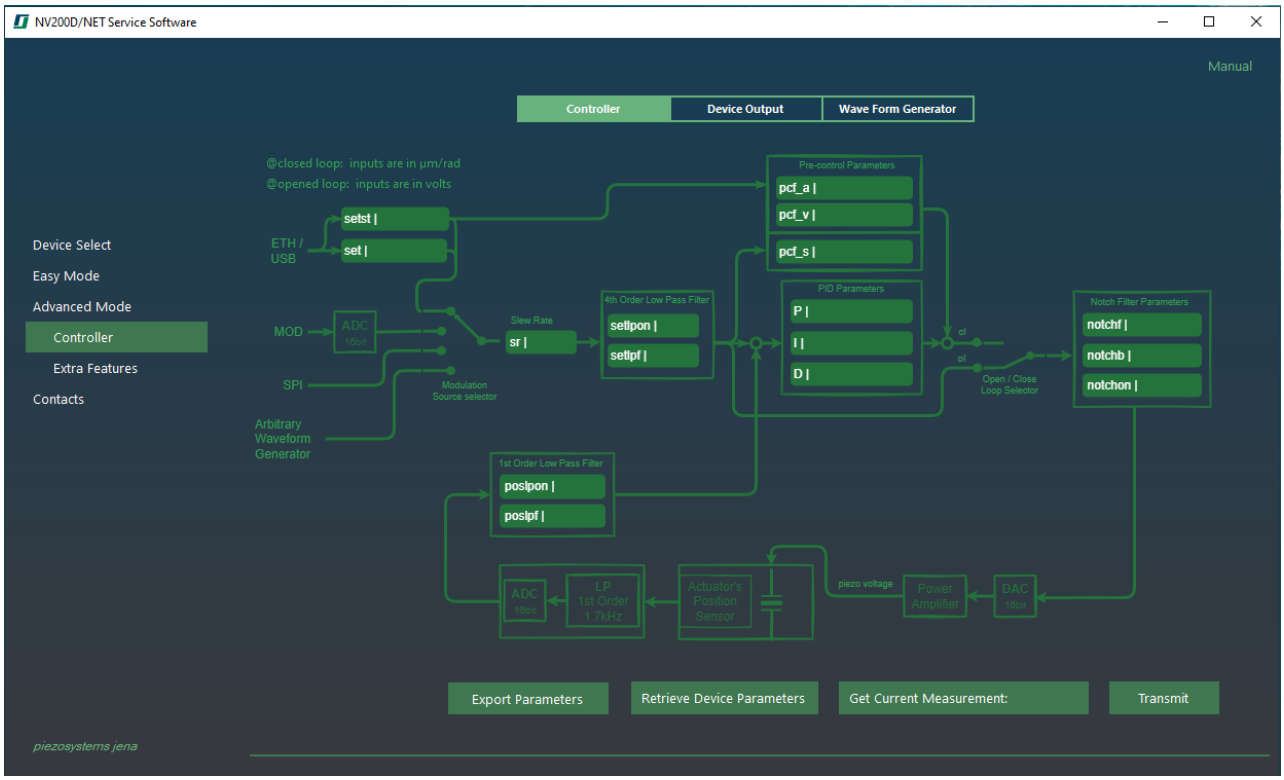

Figure 5 Before the Retrieve Parameters button pressed

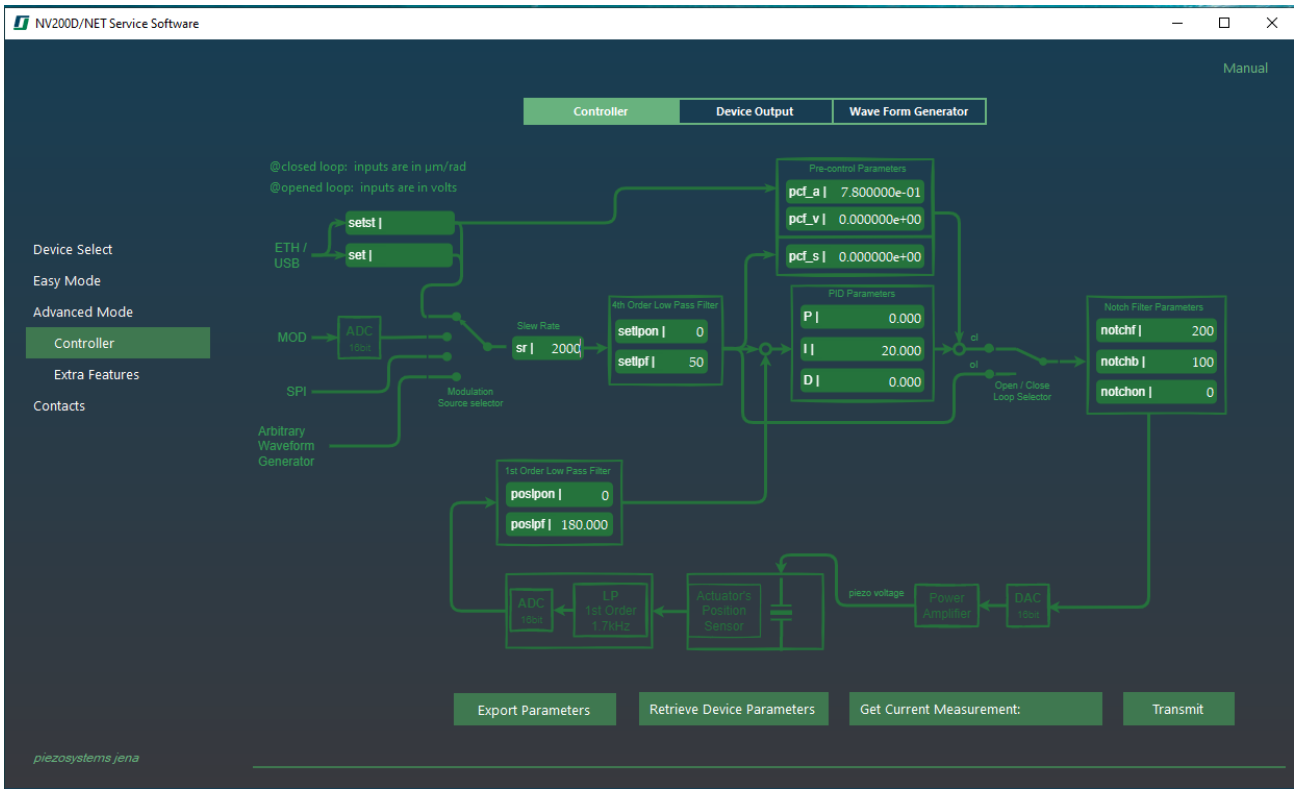

Figure 6 After the Retrieved Parameters button pressed

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3.4.2 Device Output Tab

Once the actuator has moved, the possibility to obtain the movement curve of the piezo is not far from reality. Simply, in **Device Output** Tab (**Figure 7**), by pressing the **Get Data Recorder** button all the movements with predefined resolution can be observed. Let's run an example:

First using the **set** command in the **Controller** tab, move the actuator to the 60th micrometre.

- **set,60**
- press **Transmit** or **Enter** from the keyboard
- shift to the **Device Output** tab from the top
- press the **Get Data Recorder** button from the bottom rightmost
- Wait for the results to be transmitted from the amplifier (**Figure 8**)
- If wished, can be exported by pressing the **Export Graph** button
- If wished, the graph points can be generated automatically by pressing the **Export Set Points** button

Not satisfied with the outcome?

Then refer to the Controller tab and change the parameters and play with the variables until the desired output is achieved.

The **Get Resonance Spectrum** button in this view is created to find the natural frequency of the current system. The spectrum is subject to changes under different loads and orientations and with this function of the Service Tool, the changes can be recorded and observed actively. Refer to Figure x for an example result (**Figure 9**).

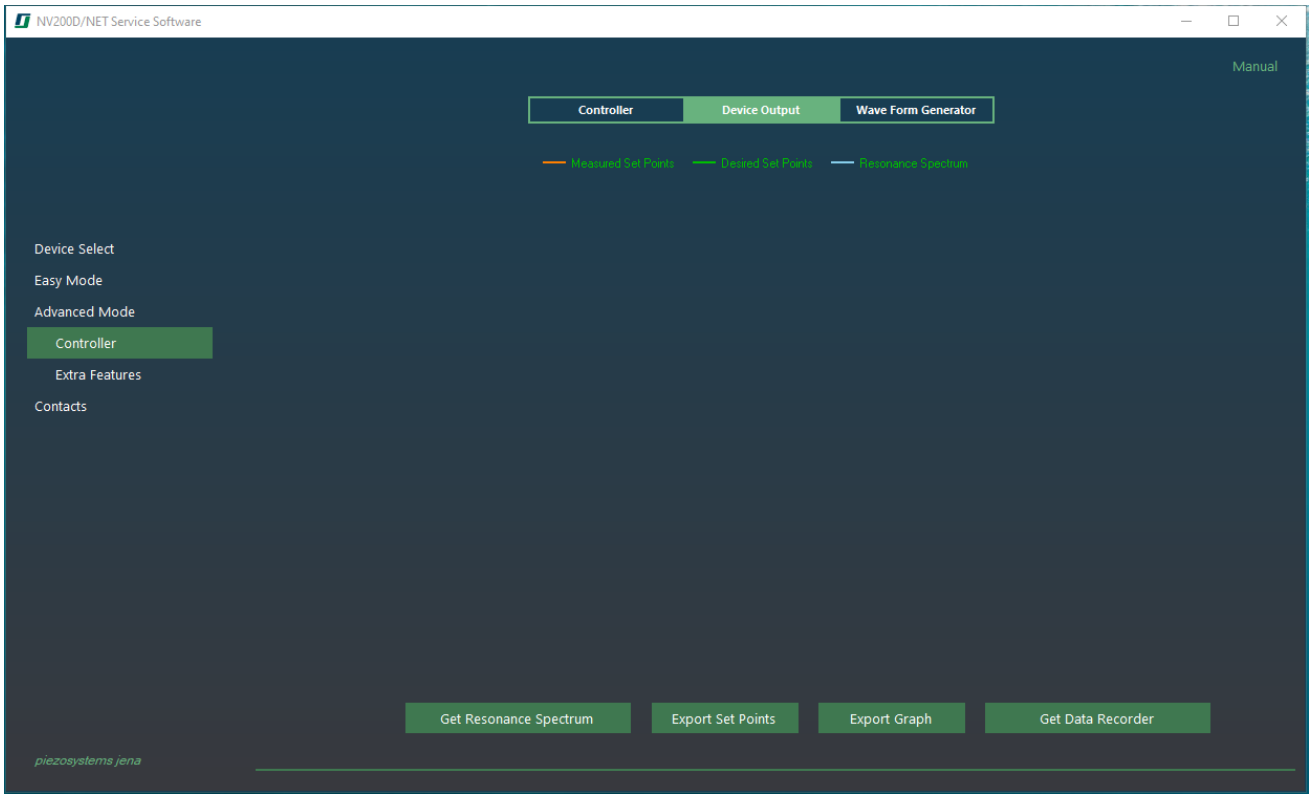

Figure 7 Before any measurement is initiated

Figure 8 after the Get Data Recorder button is pressed

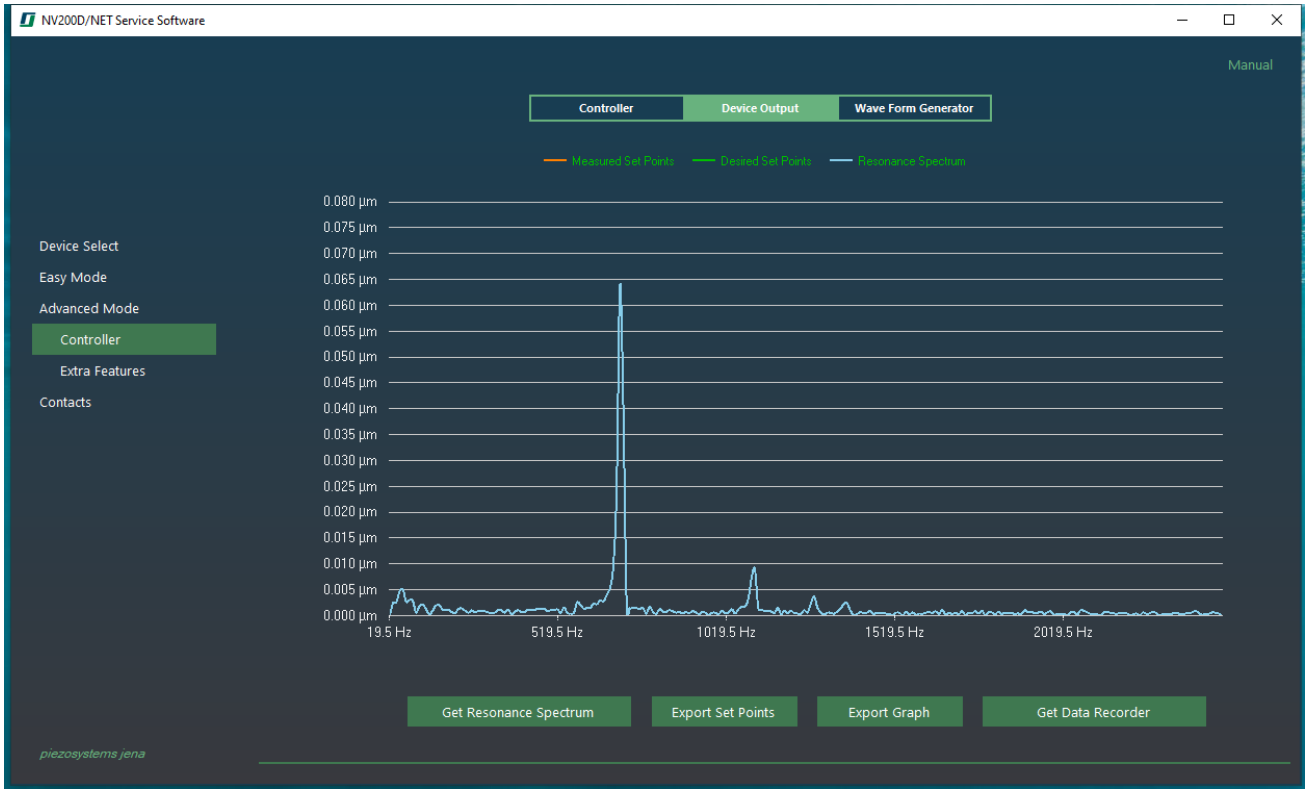

Figure 9 Resonance spectrum of the actuator

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3.4.3 Wave Form Generator Tab

In this view, it is possible to design 3 different main wave types by selecting one of the wave sources from the top drop box. In case the arbitrary waveform is predefined already existing, the Import button can be pressed to import the data set. Keep in mind that only text files are acceptable and the values must be comma-separated values. Each value must be in percentages not in any specific units like Volts or micrometers.

After selecting the wave source/importing to make the actuator move as described, the sequence of button presses must be realized (**Figure 10**).

- **Create New Wave** – this will display the new wave but will not immediately affect the amplifier or actuator.
- **Transmit** – this will send the created list of set points in percentages to the internal function generator in the NV200D/NET amplifier.
- **Start** – this will start the NV200D/NET amplifier to take action on the sent data set and will start the movement. The sound that comes from the actuator.
- **Stop** – this will be either automatically called by the Service Tool during finite cycles or needs to be pressed by the user if the **Cycles** is equal to 0 (**Cycles** = 0 means that the NV200D/NET will run the function generator infinitely).
- To check the results of the actuator, switch back to the **Device Output** Tab from the top of the Service Tool. And press the **Get Data Recorder** button (**Figure 11**).

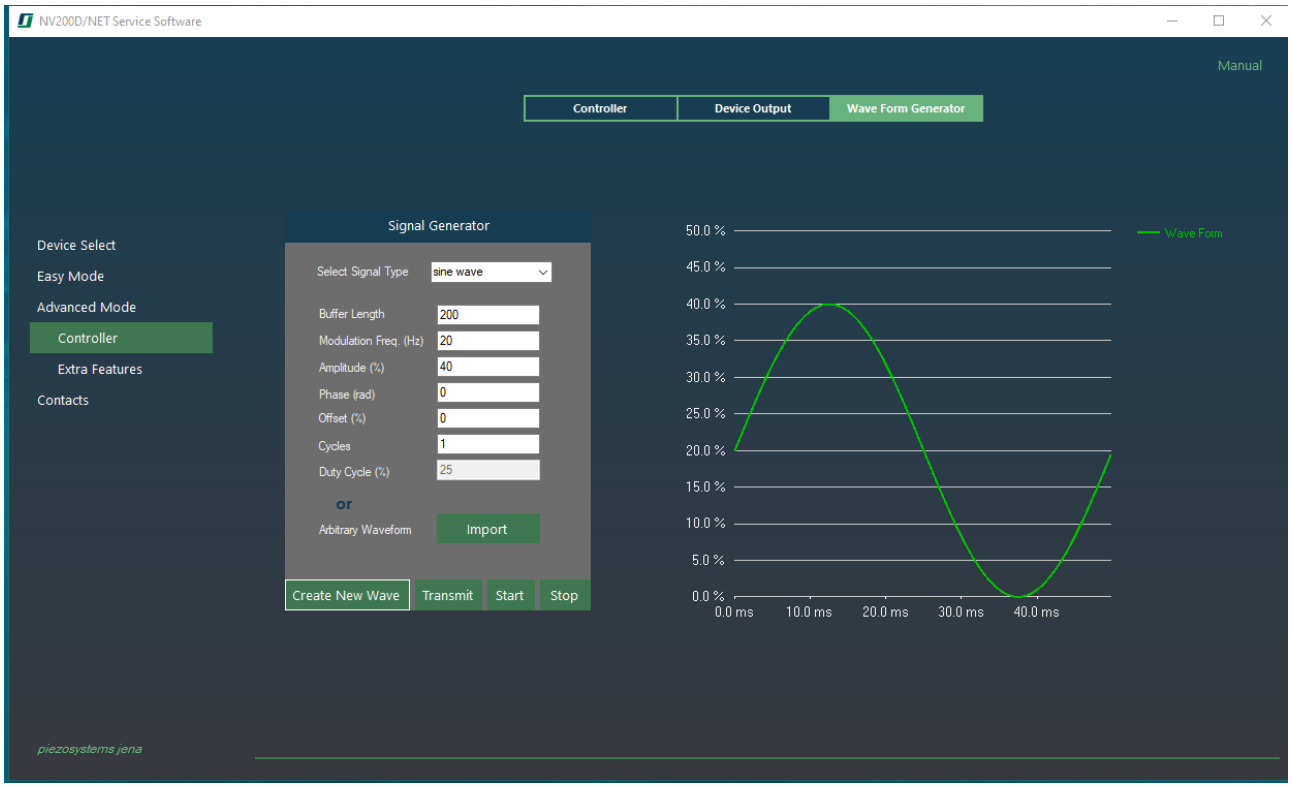

Figure 10 Creating a new wave Form

Figure 11 Wave Form generated movement feedback from the NV200D/NET

Alternatively, any Arbitrary Wave Form can be used by just importing. Here is an example of using one:

- **Import** – select existing comma-separated set points such as in the example *Arbitrarywaveform*.txt file. Please refer to the example text file for details.
- **Create New Wave** – this will load the desired arbitrary waveform to the chart so that can be previewed before sending (**Figure 12**).
- **Transmit** – this will transmit the whole data to the internal buffer of the NV200D/NET amplifier.
- **Start** – this will start the function generator to read the internal buffer from the amplifier and move the actuator.
- **Stop** – this needs to be pressed only if **Cycles** = 0, and the movement needs to be finished.
- To get the **measurements** – switch to **Device Output** again and press the **Get Data Recorder** button (**Figure 13**).

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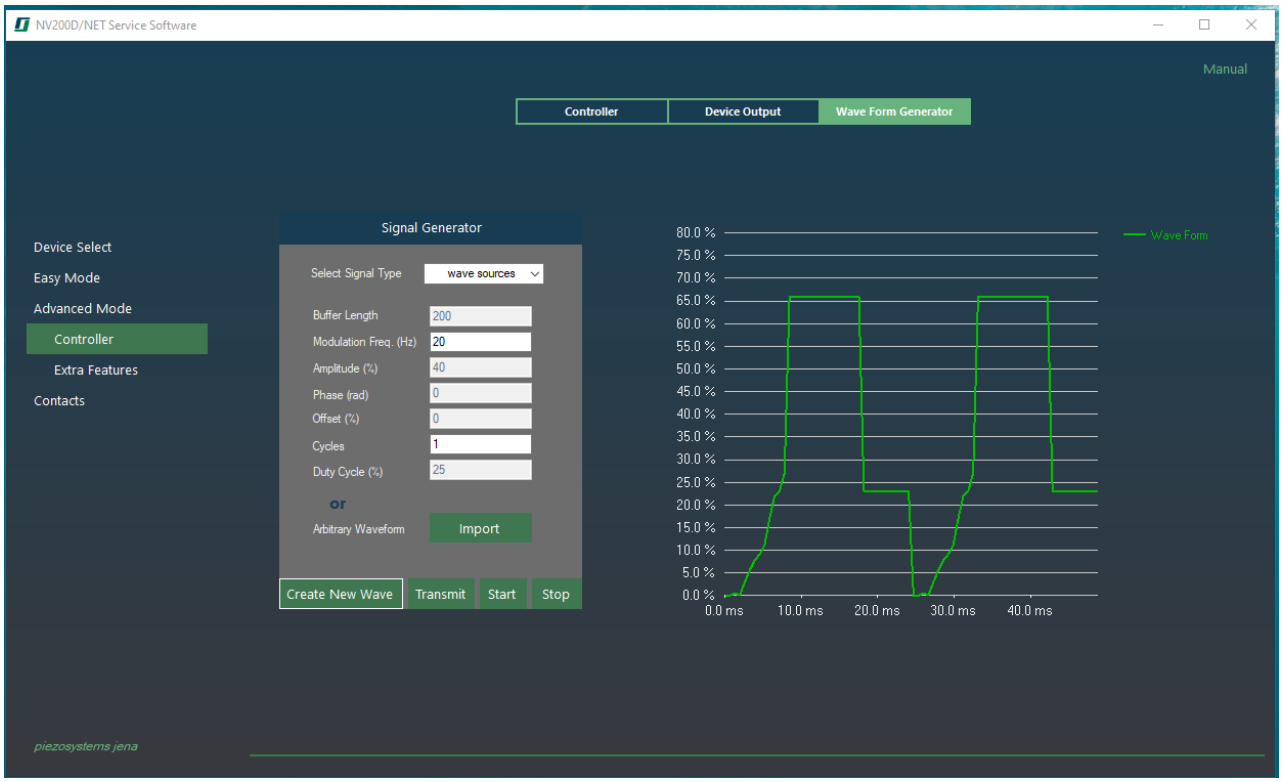

Figure 12 Preview of Imported arbitrary wave

Figure 13 Amplifier feedback of the arbitrary waveform movement

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3.5 Contacts

This page is giving access to the user to be able to contact our US or German office (**Figure 14**).

Just click on the green email links below and start describing your problem or feedback. We will help as soon as possible!

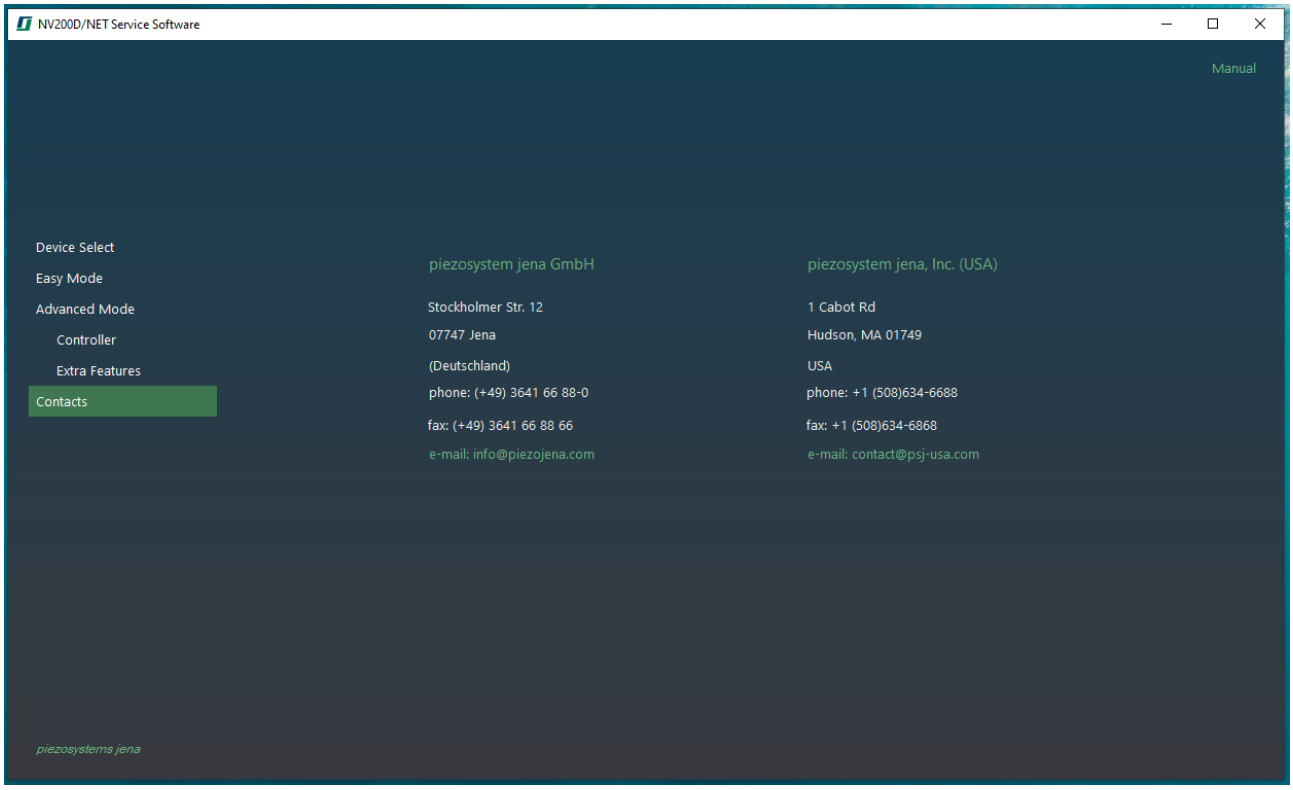

Figure 14 Contacts View