System requirements: All software modules are compatible to Windows 10. If multiple PCs are used for the operation of different devices of one setup, a network connection is required for the automation using *thaTEC:OS*.

⚠ **CAUTION:** Software modules use **unencrypted TCP-based communication**. For security reasons we recommend use in secure local networks.

⚠ **CAUTION:** Software modules can be used to control mechanical, electrical and/or optical devices and components. **Misuse of these devices can cause damage or injuries!** The control of these devices requires trained personal!

Note: For the software installation (step [13] and following), a basic knowledge on the operation of the software *thaTEC:Core* is required. For this, please refer to the *thaTEC:core and thaTEC:OS Demo - Quick start guide* available in the download section under www.thatec-innovation.com.

Note: In the following, the term *PC* always refers to the PC where the software module *thaTEC:TFPDAS5* is running.

Note: If you are using additional hardware to perform time-resolved measurements using the *JRS TFP-interferometer*, please follow this manual for the basic setup. The additional setup of the time-resolution hardware will be provided via e-mail depending on the additional hardware.

If you encounter any issues during the soft- or hardware installation, **DO NOT** continue and contact us immediately under contact@thatec-innovation.com !

For the installation of the DAQ hardware and thaTEC:TFPDAS5, **carefully follow each step** below:

[1] Carefully read the manuals for all DAQ modules (*NI-9401, NI-9403, NI-9264*) and for the *cDAQ-9174* chassis provided by *National Instruments* (www.ni.com).

[2] Referring to the manuals from [1], insert the DAQ modules into the *NI cDAQ-9174 chassis* in the order indicated in Fig. 1.

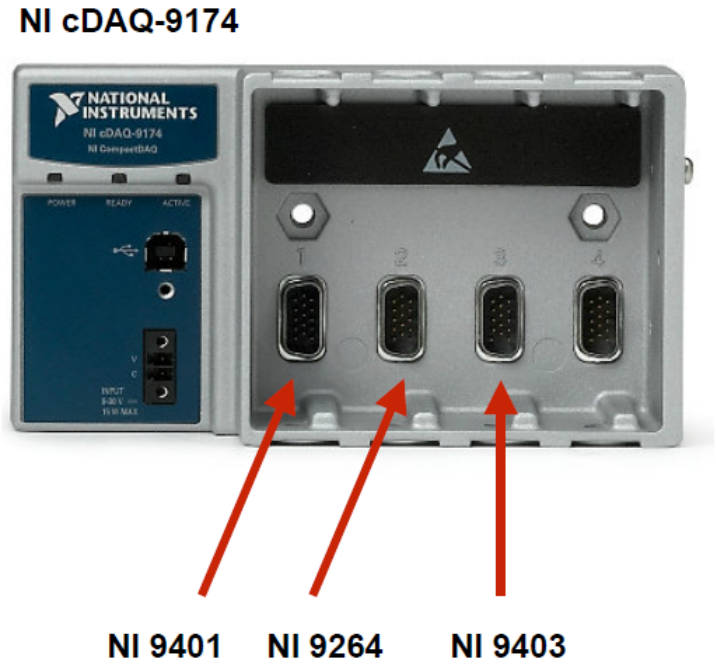


Figure 1: Positions for the single DAQ modules in the *NI cDAQ-9174 chassis*.

[3] Referring to the *National Instruments* manuals from [1], plug in the power supply for the *NI cDAQ-9174 chassis* and connect it to the PC using the included USB cable.

[4] Download *thaTEC:Core installer* from the download section on our homepage (www.thatec-innovation.com) and install it on the PC by confirming all dialogues and using the standard settings and installation directories. If you encounter any issues during the installation process, please contact us under contact@thatec-innovation.com.

[5] After the successful installation of *thaTEC:Core*, open the installed *NI MAX* software from the Windows start menu. Check the names of the NI DAQ modules as shown in Fig. 2 and rename the modules if required.

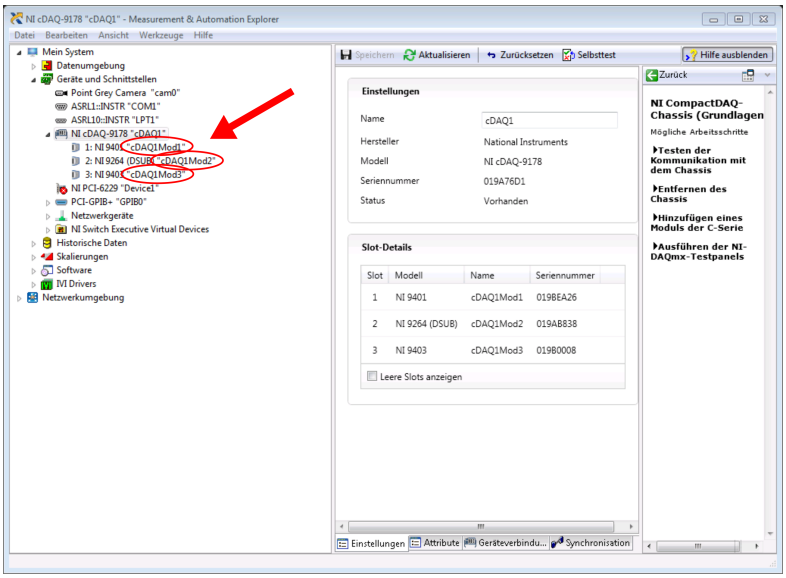


Figure 2: Rename the *NI DAQ modules* in the *NI MAX* software as shown in the image. Attention: the image shows the settings for the *NI cDAQ-9178 chassis*, the settings for the *NI cDAQ-9174 chassis* are analog to the settings shown above.

[6] ⚠ Before connecting the *THATec Innovation DAQ hardware* to the *JRS control unit TFP-CU*, block any laser light which might enter the TFP through the sample beam path or the reference beam path of the Sandercock interferometer and/or switch off the photodetector to prevent any damage.

[7] Use the included D-SUB cables to connect all 3 *NI DAQ modules* to the *THATec Innovation Breakout Box*. All cables are labeled to assure a correct setup. Check again that the *NI 9403* and the *NI 9264* modules are connected to the correct inputs on the back of the *THATec Innovation Breakout Box*. DO NOT yet connect the 15-pin D-SUB cable to the *JRS control unit TFP-CU*!

[8] Disconnect the BNC cable from the photodetector of the TFP-interferometer from the rear of the *JRS control unit TFP-CU* and connect it to the according input on the front *THATec Innovation DAQ Breakout Box*. You can use the included BNC cable and adapter if the installed cable is too short.

[9] ⚠ Make sure that the *Stabilization* switch on the front of the *JRS control unit TFP-CU* is switched to *off* (see also Fig. 3)!

[10] ⚠ Make sure that the mode-switch for the doubleshutter of the TFP on the front of the *JRS control unit TFP-CU* is switched to "*Window*" (see also Fig. 3)! You should hear a clicking noise from the doubleshutter!

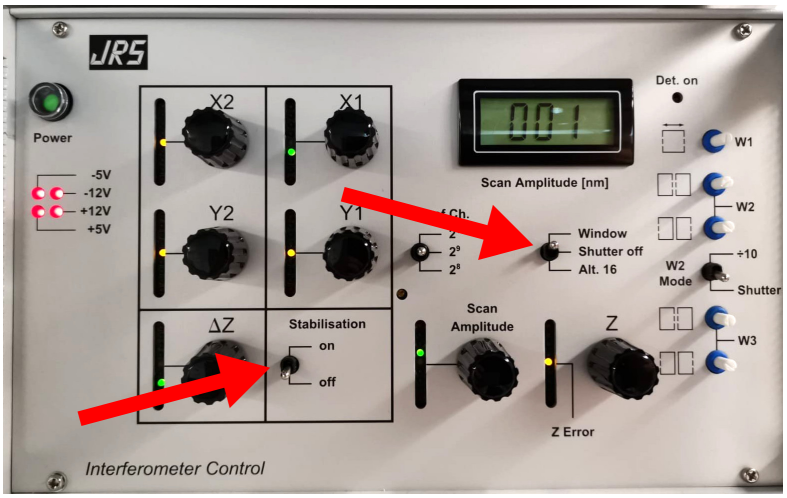


Figure 3: Check the position of the *Stabilization* switch and the mode-switch for the doubleshutter of the TFP on the front of the *JRS control unit TFP-CU*.

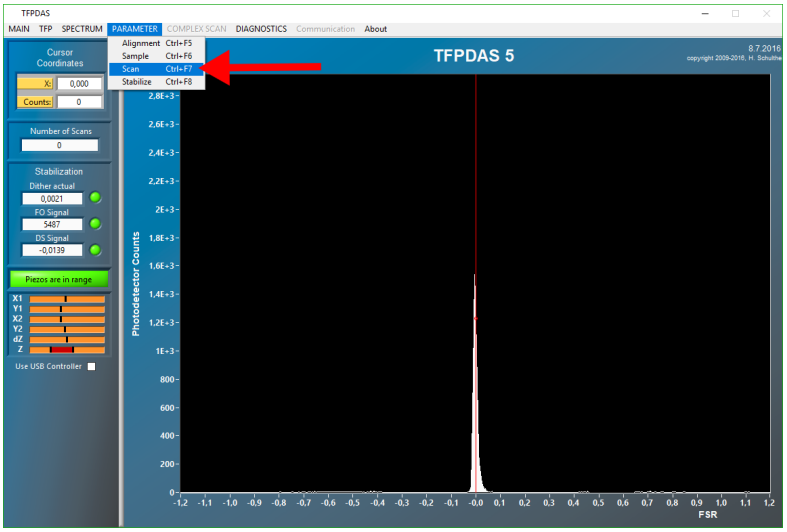
[11] ⚠ Using the included 15-pin D-SUB cable, connect the *"TFP-CU"* output on the back of the *THATec Innovation Breakout Box* and the *"Remote"* input on the back of the *JRS control unit TFP-CU* . Now, the clicking noise of the doubleshutter should stop! If not, DO NOT continue with the following steps and contact us under contact@thatec-innovation.com!

[12] ⚠ Reboot the PC and carefully listen to any clicking noise of the doubleshutter of the *TFP-interferometer*, if the doubleshutter is clicking, DO NOT continue with the following steps and contact us under contact@thatec-innovation.com!

[13] Insert the included *Sentinel HL MAX USB dongle* to the PC or any other PC in the network (installation of *thaTEC:Core* required). Download and install the latest version of *thaTEC:TFPDAS5* using *thaTEC:Core* (For this, as noted on page 1, please refer to the *thaTEC:core and thaTEC:OS Demo - Quick start guide* available in the download section under www.thatec-innovation.com.)

[14] After the successful installation, open *thaTEC:TFPDAS5*.

[15] Open the scan parameters from the menu via *PARAMETER* → *Scan* or by pressing *Ctrl+F7*:



[16] Adjust the *Maximum Counts per millisecond* according to the specifications of the installed detector in the *TFP-interferometer*, and, if necessary, adjust the laser wavelength to the used laser (see also Fig. 4). Confirm the subsequent popup and close the *Scan Parameters* window by clicking the *OK* button:

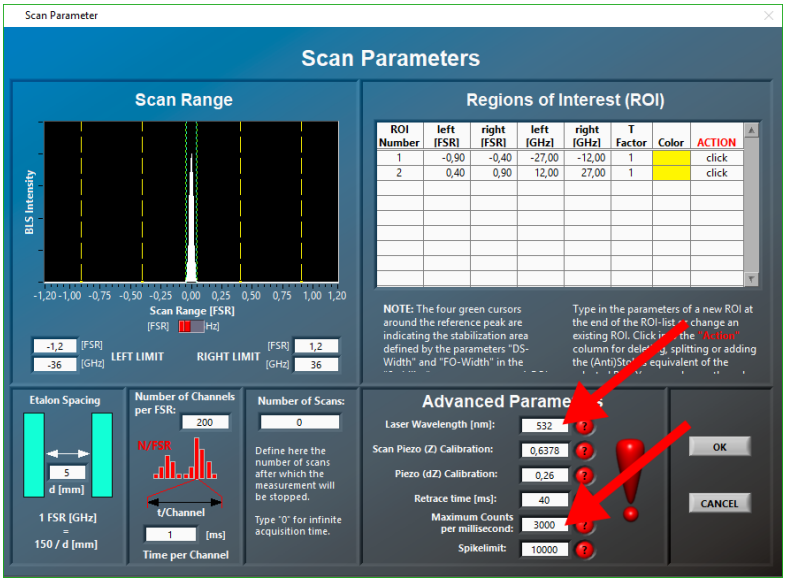
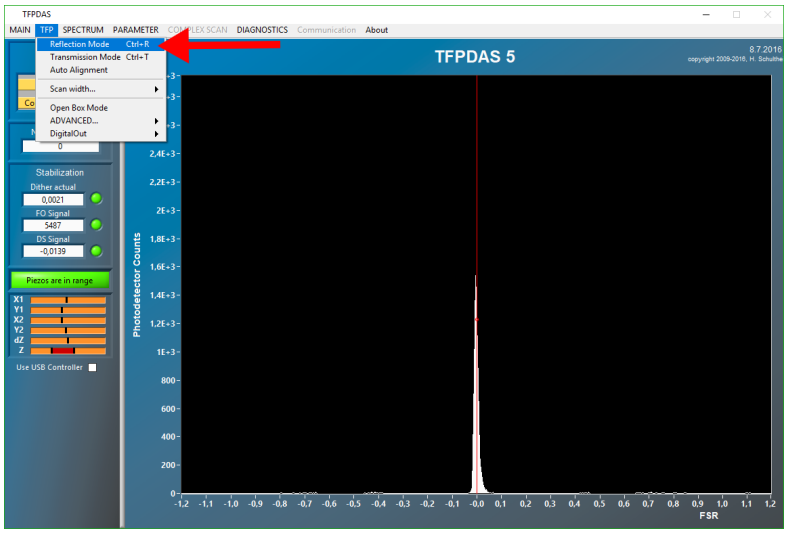
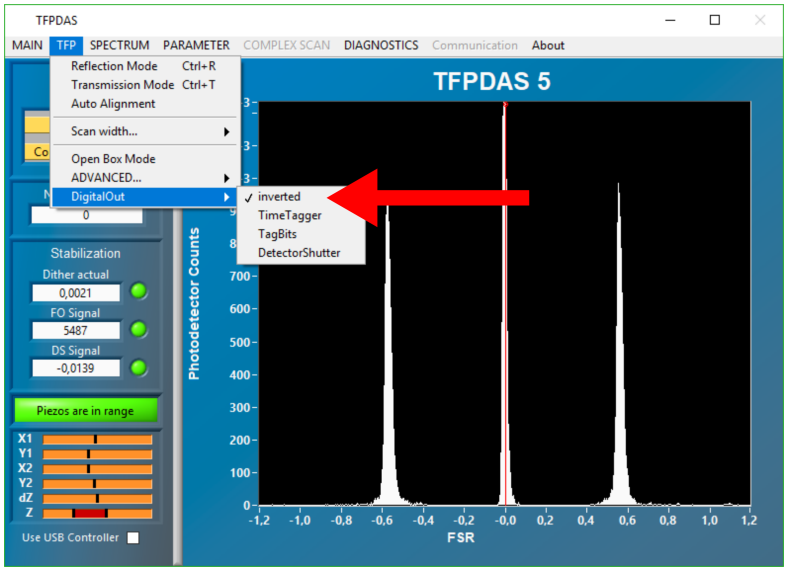


Figure 4: Check and adjust the *Laser wavelength* and the *Maximum Counts per millisecond* parameters.

[17] Bring the TFP into *Reflection Mode (Alignment mode)* via the menu bar *TFP* → *Reflection Mode* or by pressing *Ctrl+R*:



[18] ⚠ Make sure that the moving stage inside the *JRS TFP-interferometer* moves into alignment mode and **stays in this position**!
If the stage moves back into transmission mode, press *Escape* to stop the scanning in the software and, subsequently, check (or uncheck) the *"inverted"* tag in the menu bar *TFP* → *DigitalOut* and repeat step [17]. If you encounter any issues, please contact us under contact@thatec-innovation.com.



[19] If you switched off the photodetector in step [6], switch on the detector again while still blocking any laser light going into the *TFP-interferometer*! **Make sure that the software is not in idle mode by pressing *Ctrl+R*!** Scale the intensity of the spectrum in the main window of the *TFPDAS 5 module* using the *arrow-up* (↑) and *arrow-down* (↓) keys on the keyboard until you see the noise of the detector as exemplarily shon in Fig. 5:

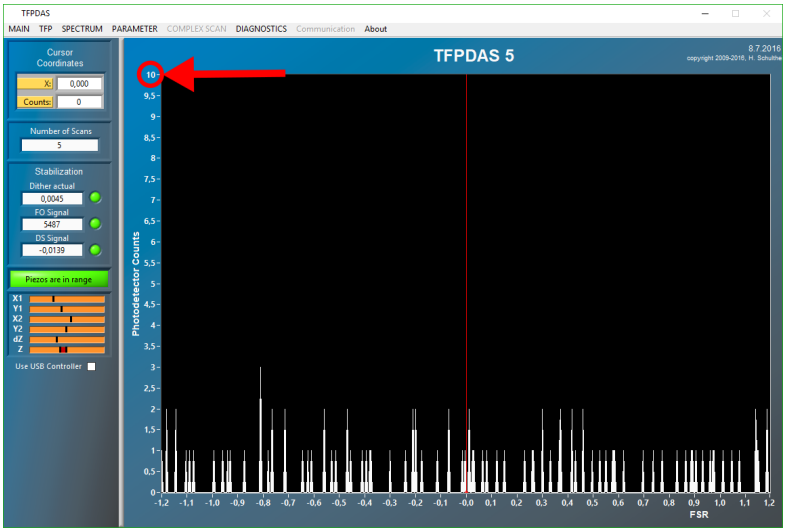


Figure 5: Scale the intensity until you see the noise level of the detector.

For the following steps, please also refer to the according sections in the *TFPDAS5 user manual*!

[20] As described in [19], by using the arrow keys on the keyboard, rescale the y-axis of the spectrum again to a maximum value of ≈ 400 counts. Subsequently, carefully unblock the laser light inciding on the reference beam side of the doubleshutter unit of the *TFP-interferometer* and adjust the overall intensity to 300 to 400 counts as shown in Fig. 6. You should see two - more or less distinct - dips in the spectrum originating from the two FPIs:

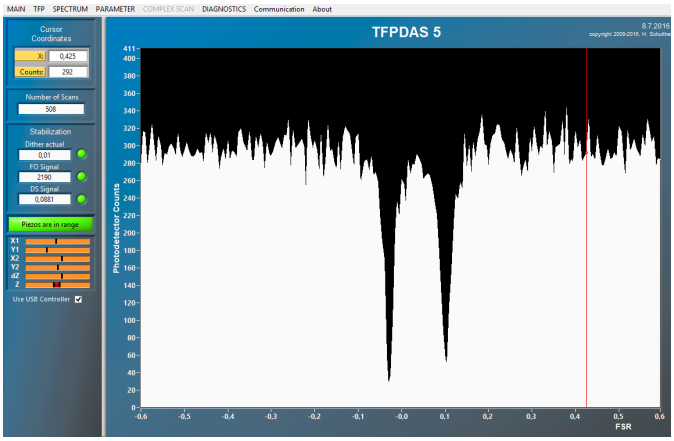


Figure 6: Exemplary signal obtained in *reflection mode*. The two dips originate from the two etalons of the *TFP-interferometer*.

[21] Start the calibration routines for the z- and the dz-Piezo via the menu bar *DIAGNOSTICS → Piezo Calibration (Z)* and *DIAGNOSTICS → Piezo Calibration (dZ)*. These routines may take some minutes until they are completed and towards the end of each calibration routine, the signal will be accumulated, hence, the indicated signal will drastically increase. Please note that the laser intensity on the detector remains unchanged and no damage will occur!
After each calibration routine, check the acquired signal. **Confirm the new calibration values ONLY IF TWO CLEAR DIPS ARE PRESENT IN THE SPECTRUM AND THE RED LINES COINCIDE WITH THESE DIPS as exemplarily shown in Fig. 7!** Otherwise, cancel the dialog and restart the calibration routine.

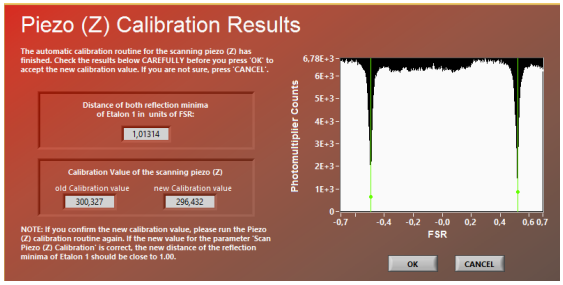
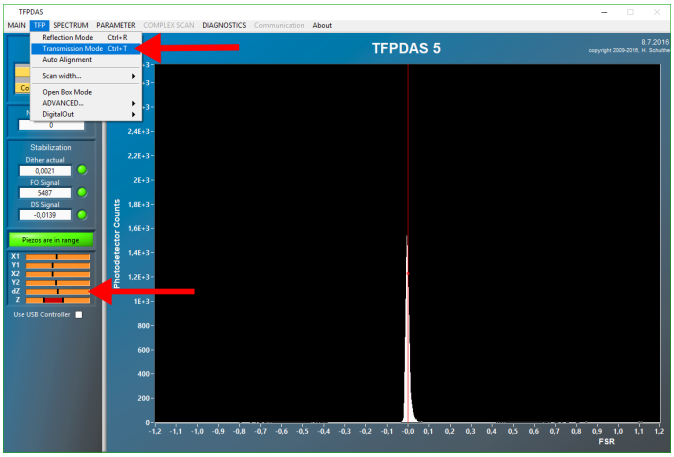


Figure 7: Only confirm the new calibration values if two distinct dips are present in the spectrum an the green cursors coincide with these dips!

[22] After the successful calibration of the z- and dz-Piezo, switch the interferometer back to *reflection mode* as described in step 17 and start the *Auto Alignment* routine via the menu bar *TFP* $\rightarrow$ *Auto Alignment*. Again, this process might take some minutes to complete. After this, the *TFP-interferometer* automatically switches to *Transmission Mode* and a clear peak in the center of the spectrum should be visible.
If this is not the case, you might switch back to *Reflection Mode* and manually adjust the dZ-Piezo so that the dips of the two etalons coincide. To do so, place the mouse over the dZ indicator on the left hand side of the main window, press *Ctrl* and use the mouse wheel to adjust the dZ Piezo. Subsequently, switch back to Transmission mode via the menu bar *TFP* $\rightarrow$ *Transmission Mode* or by pressing *Ctrl+T*:



Now, a clear peak should occur in the center of the spectrum and the automatic stabilization routine should continuously increase the intensity of this peak during the stabilization process. With this, the setup of the *DAQ hardware* and of the *thaTEC:TFPDAS5* software is completed. For further instructions and in order to take spectra, please refer to the *TFPDAS5 user manual*.