

SPIKE®

sensory tool holder

- drilling
- milling
- grinding
- threading
- reaming
- friction stir welding



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wireless solutions

User Manual

Sensory Tool Holder

SPIKE®

Software User Manual
- English -

SPIKE® BTKaBlue

Software Version 13.4

Article Nr. 41000308



Imprint

User Manual
“Starting Kit Sensory Tool Holder SPIKE®
with SPIKE® BTKaBlue V 13.4 “
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1 Instructions for start-up

Before starting the SPIKE® system the user manual and all instruction materials contained in the case should be read carefully.

1.1 Compliance Statement

This device is for business or industrial use only and must be professionally installed. This device complies with Part 15 of the FCC Rules and with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

NOTICE:

Changes or modifications made to this equipment not expressly approved by pro-micron may void the FCC authorization to operate this equipment.

1.2 Electromagnetic Compatibility (EMC)

The Sensory Toolholder SPIKE and the Receiver Unit READ is designed to conform to CE and meets all technical safety requirements with respect to electromagnetic compatibility according to EN 61000-6-2 (interference resistance and EN 61000-6-4 (industrial interference resistance)

2 Disposal instructions

Environmentally friendly and recyclable materials are used for the packaging of our products that do not pollute the environment. We urge you to provide for proper disposal of the packaging material.

3 Used symbols and signal words

Due to possible typographical and printing errors, and the need for continuous technical change, please understand that we cannot assume any liability for the correctness.

Important points in this manual are labeled with a symbol.

-  **DANGER** indicates a potential hazard, that could result from improper use, that will lead to death or serious injuries.
-  **WARNING** indicates a potential hazard, that could result from improper use, that could lead to death or serious injury.
-  **CAUTION** indicates a potential hazard, that could result from improper use, which can lead to minor injuries.
-  **ATTENTION** identifies measures to avoid bugs and property damage.
-  Important information or further advice on the correct use of the system.
-  Program features that require registration.

4 Labeling

For identification the SPIKE® system has a unique serial number, which is located on the outside of the sensory ring. In addition, the serial number is programmed into your device. The serial number of the receiver Unit (READ is placed on the bottom of the device

5 Security and Warnings

-  Operation with rotating tool holder is only permitted in a closed processing space.
-  Always use the supplied power cord when charging the SPIKE.
-  Before using the tool holder, check to ensure proper function with your Automatic Tool Change System. Due to the wide variance of automatic tool change systems, pro-micron cannot foresee every particular application the SPIKE may be used for, and it is the user's ultimate responsibility to ensure proper function in the machine tool.
-  The READ receiver must not be opened.

6 General information

We accept no liability for the improper use, and the consequences arising out of improper use by the end-user.

All information and instructions in this manual describe the current state of development. Used figures and illustrations are symbolic photos. Due to possible typographical and printing errors, and the need for continuous technical change, please understand that we cannot assume any liability for the correctness.

7 Target group

This manual is directed to trained personnel. The contents of this manual should be made available for staff members and implemented into practice when using the SPIKE.

8 Fields of application

The system is designed to measure forces and moments acting on the tool holder during machining. The main application is the milling, but it can also be used for drilling, threading, etc.

Scope of supply

The SPIKE®-system contains at least:

Quantity	Description	pro-micron Article-Nr.
1	Tool holder SPIKE	
1	Charging station	
1	Power cord for charging station	
1	Receiving Unit (READ)	
1	Antenna	
1	USB – READ cable	
1	USB – Charging cable	
1	PC software SPIKE® BTKaBlue V 13.4	
1	User manual	

Additional components may be included. Please check your order.

9 Product description

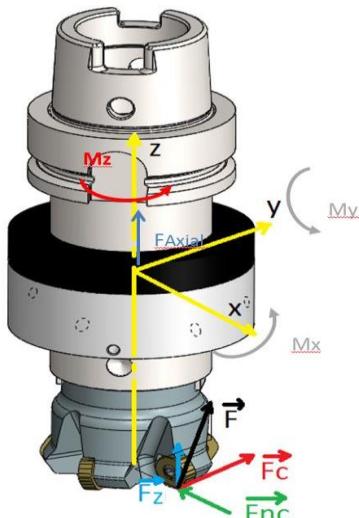
The **sensory tool holder SPIKE®** is a wireless force sensor used as a diagnosis tool or for **tool monitoring**. During machining (e.g. drilling or milling), it can measure the generated **force** and **torque** directly at the tool holder. The data can then be transmitted **wirelessly** to a REAS receiver. The SPIKE® can be utilized to **optimize** cutting and milling processes.



The included PC- software allows the user to measure and visualize axial forces, torsion and resulting bending. The resulting raw data is stored in plain text file format (ASCII) and can be easily exported and used for **analysis** afterwards.

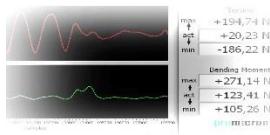
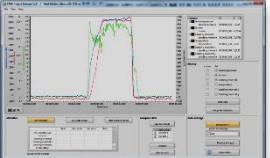
A distinctive feature of the software is the depiction of measurement values in a polar diagram. In this diagram the bending torque acting on the tool holder is shown as an angular function. Because of this, forces can be detected over the life of the tool or even the forces on different cutting fluids can be detected. An integrated temperature sensor detects temperature at the place of the sensory ring and therefor can show tendencies of the process temperature. For its mobile use, the SPIKE® is powered via an **integrated Li-Polymer** rechargeable battery. For easy analysis and documentation of the measurement results, optional tool analyzer software is offered.

Overview over the measured forces:



- **“Torsion”** signal representing the torque M_z which correlates to the cutting force F_c multiplied with the radius of the tool holder
- **“Bending moment”** in x and y direction: Signals representing the bending moments M_x and M_y . These two components are vector aggregated to get the **total bending moment**, which correlates to the vector sum of the forces F_c and F_{nc} multiplied with the lever arm
- **“Axial force”** signal representing a combination of the axial force and the force F_{nc}

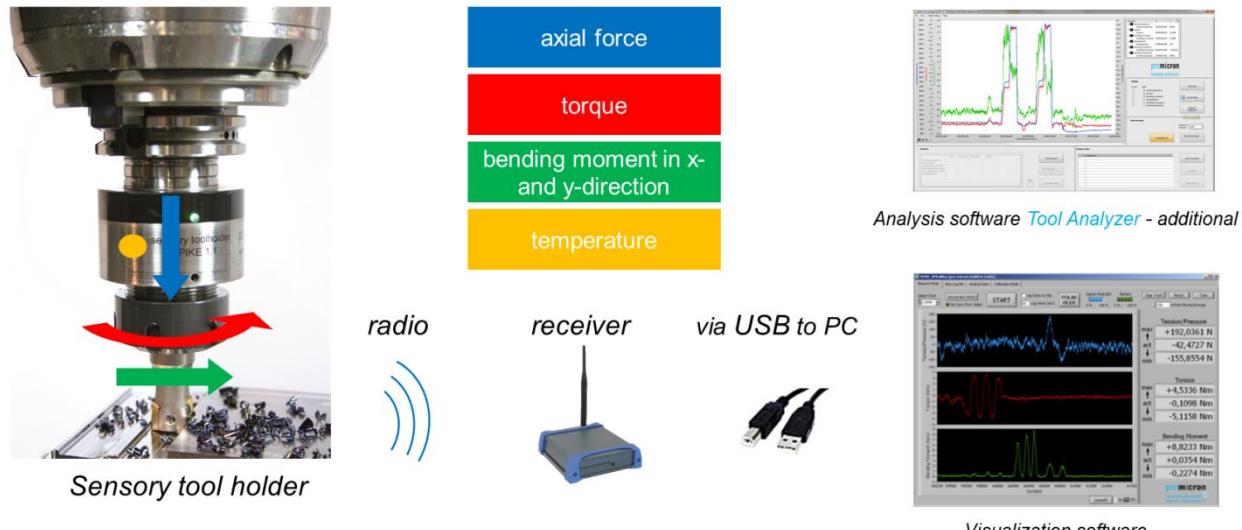
10 System components

Component	Description
	Sensory tool holder SPIKE®
	Charging station incl. power cord
	READ Wireless receiver with integrated USB interface
	Visualization software CD SPIKE® BTKaBlue V 13.4
	Tool analyzer software for easy data analysis and documentation (optional offered)

10.1 Basic arrangement of the measuring system

Measuring force and moments where these occur

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Sensory tool holder SPIKE

2

10.2 Fields of applications and motivations

Sensory tool holder SPIKE®

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Sensory tool holder SPIKE® - applications -

- milling
- drilling
- grinding
- threading
- reaming

- turning
- friction stir welding

- rolling

— serie
— prototype
— outlook

22/04/15

11 Startup

11.1 Charging the SPIKE®

Connect the supplied power cord to the charging station. To do this, use the included fitting USB cable. The socket on the charging station is located at the back.

Now place the tool holder on the charging station. On the sensory ring there are two brass-colored contact surfaces next to 2 center holes. Put the SPIKE® on the charging station that the two holes next to the contact surfaces exactly engage with the pins on the charging station. If necessary, apply gentle pressure to seat it onto the pins.

- ⓘ For orientation, the LED in the ring always looks forward.

If the contact is established, the indicator will shine magenta (red/blue). If the holder is fully loaded so the LED shines only blue. If the indicator lights up green, there is no contact established between the SPIKE® and the charging station.

- ⓘ Charging time is approximately 4 hours. Overcharging the SPIKE® is not possible due to technology in the circuitry.
- ⓘ Please charge the sensory tool holder prior to any planned measurement.

11.2 Connect Read with PC

First, the antenna must be attached to the socket provided on READ. Please make sure to screw the antenna only on the silver plug, to avoid damaging the antenna. Use the USB cable and connect the Read.

11.3 Activate SPIKE®

The tool holder can only be activated via the built-in accelerometer. In the machine, the tool holder is automatically activated from a speed of about 300rpm. Manually, the tool holder can be easily activated by spinning it in the hand. After activation measuring data is transmitted. The tool holder will turn off, if no acceleration is detected for one minute (speed of <300rpm). If several tool holders are operated on a receiver, the corresponding radio channel must first be set on the receiver. For this purpose, it has an automatic search function: If you press the button on the receiver (Attention: The tool holder must be active and the receiver must not receive anything), the receiver scans the active channel and adapts to it.



ATTENTION: If another active tool holder is within range, it is possible that the radio link is established with the secondary holder.

Now proceed with the software installation.

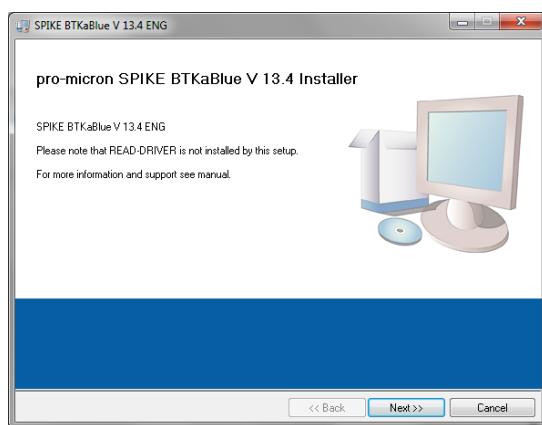
11.4 Installation SPIKE® BTKaBlue V 13.4

Minimum system requirements:

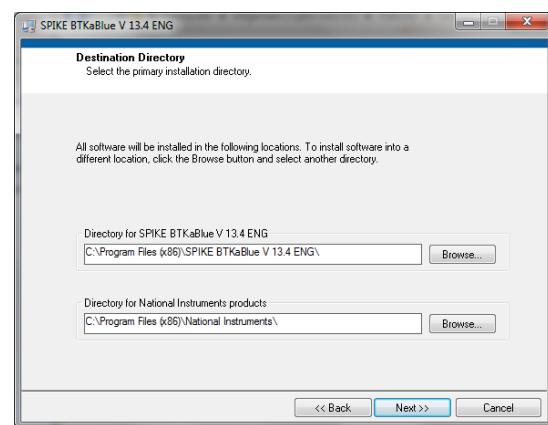
- PC compatible processor, such as Intel Pentium® III/Celeron® 866 MHz or later,
- 256 MB system memory
- Monitor with min. 1024x768 display resolution
- 450 MB of available disk space for full installation,
- DVD-ROM drive
- One available USB Port
- Microsoft Windows® XP, Windows® 7 (32 Bit and 64 Bit) or Windows® 8 (32 Bit and 64 Bit), each inclusive last service pack
- Microsoft WORD 2007/2010

Insert the CD into the CD-ROM drive of your computer. The CD should start automatically. If the menu does not start, go to “Start” -> “Run” and type in “d:\setup.exe (where d: is your CD-ROM drive)

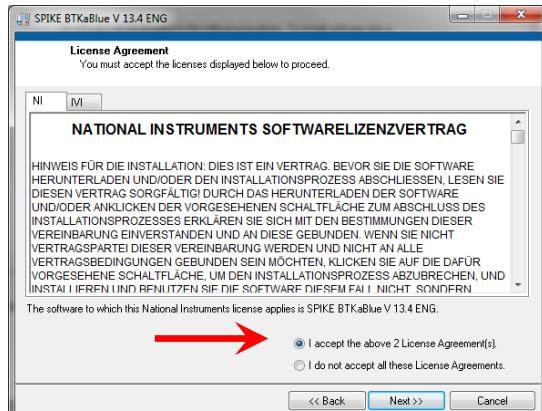
To install the software, please follow the steps below.



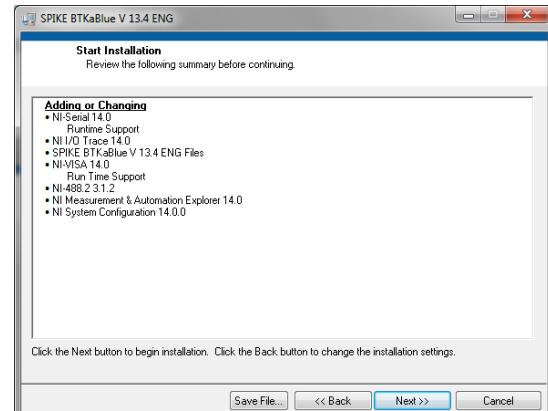
Step 1: Welcome window start, click on „Next“



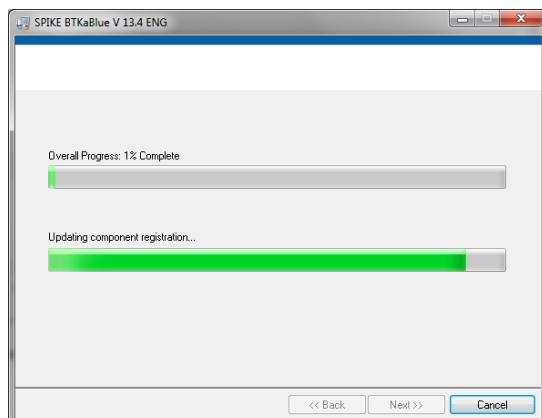
Step 2: Choose the path you want to install the software



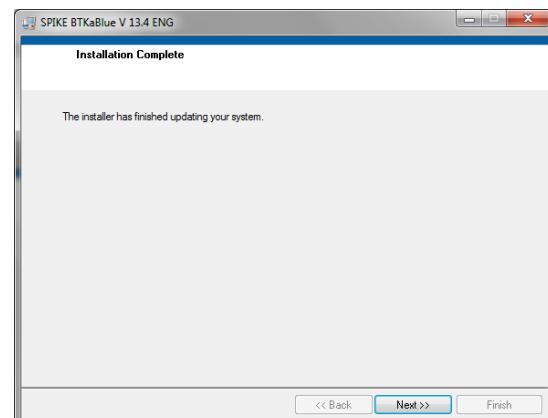
Step 3: Click on „I accept the 2-Licence Agreement(s)“



Step 4: Click on „Next“



Step 5: The installation start now ...
please wait



Step 6: Click on „Next“ to finish the installation



Step 7: Restart your computer to use the software correctly

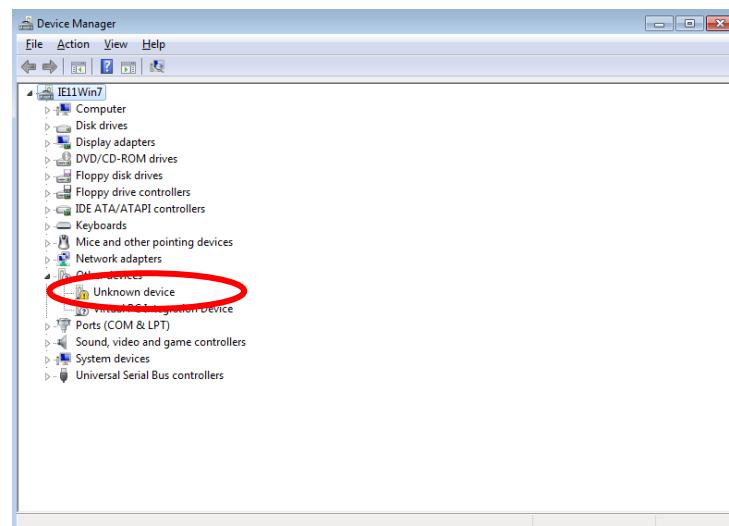
11.5 Installation READ-driver

After the installation of SPIKE® BTKaBlue V 13.4 on your computer, you must install the READ-driver before the first using of starting Kit. To do this, please follow the steps below.

Step 1: Open „Device Manager“ (s. following illustration).

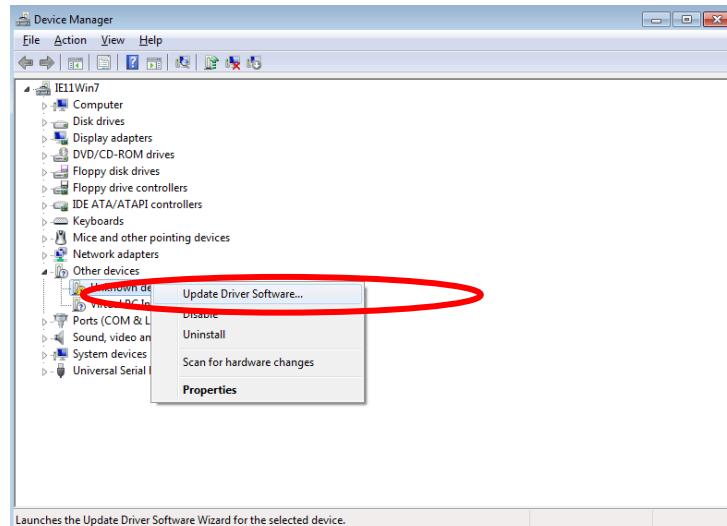
To do this:

Go to Windows Start menu → right click on Computer → click on properties → choose Device Manager from the right window. The following window should be shown.

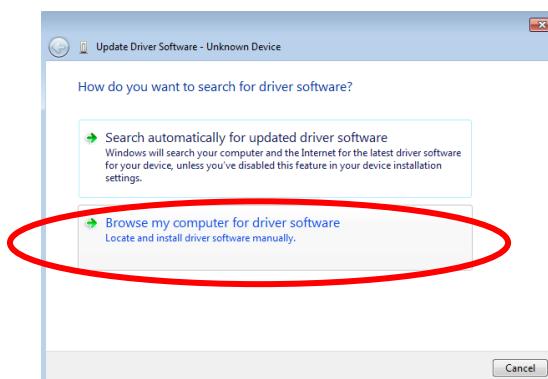


Under „Other devices“ you should see „Unknown device“ (s. upper illustration).

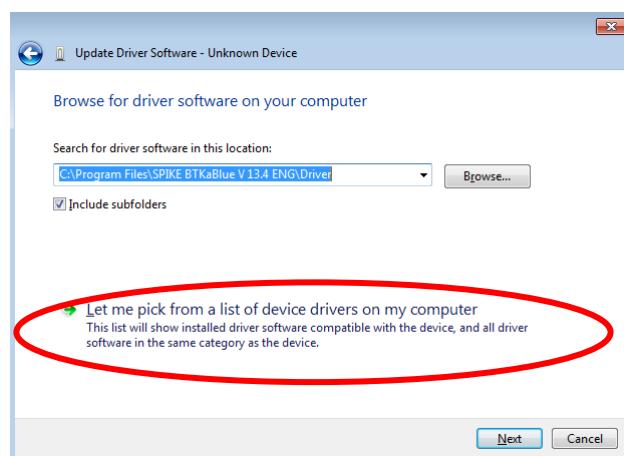
Step 2: Click on „Unknown device“ with the right mouse and choose „Update Device Software“ (s. following illustration).



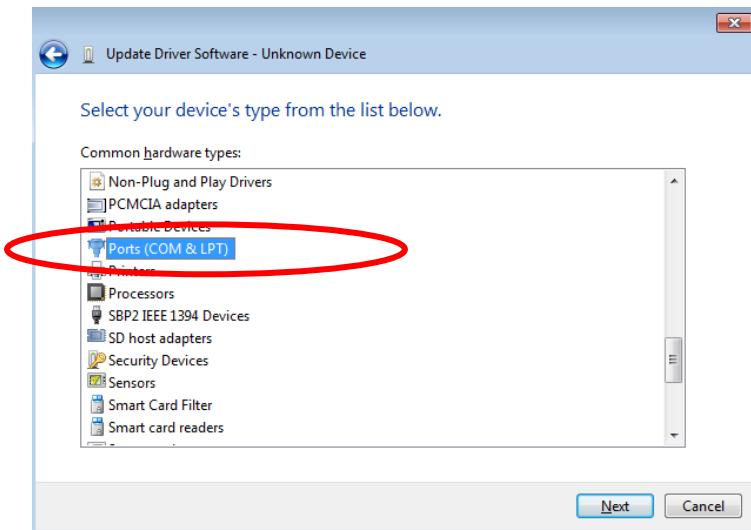
Step 3: In the following window choose „Browse my computer for driver software“.



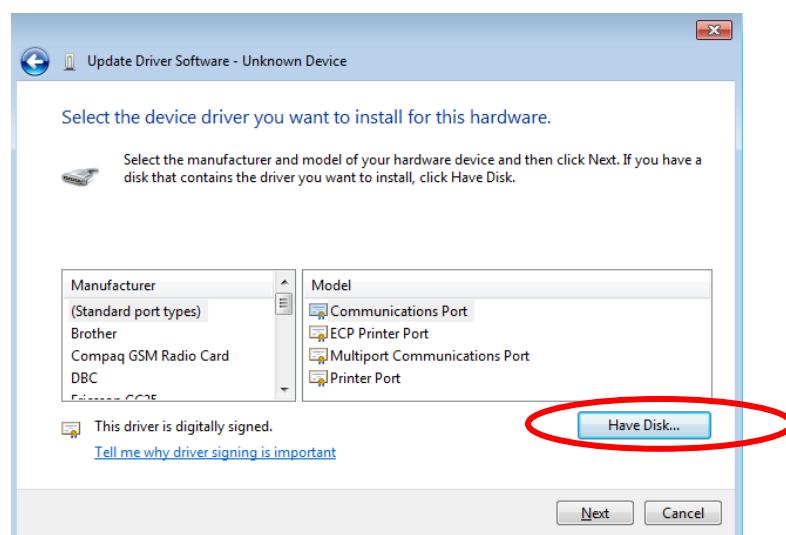
Step 4: The following window appears. Here click on „Let me pick from a list of device drivers on my computer“.



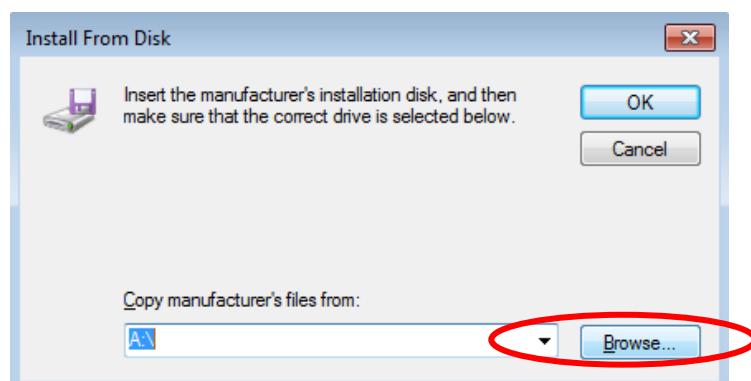
Step 5: Choose „Ports (COM & LPT)“ (s. following illustration).



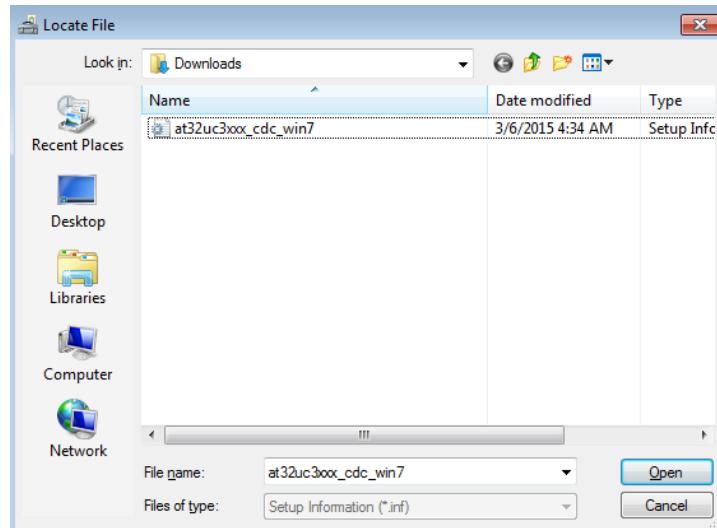
Step 6: In the following window click on „Have Disk“.



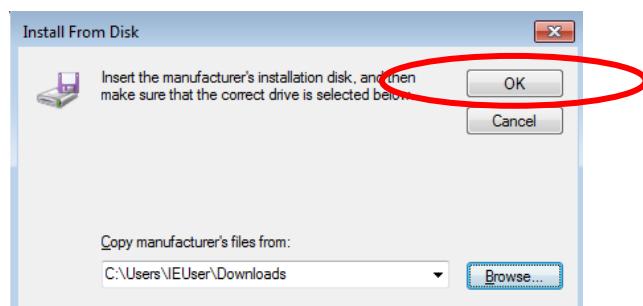
Step 7: Now click on „Browse“ (s. following window).



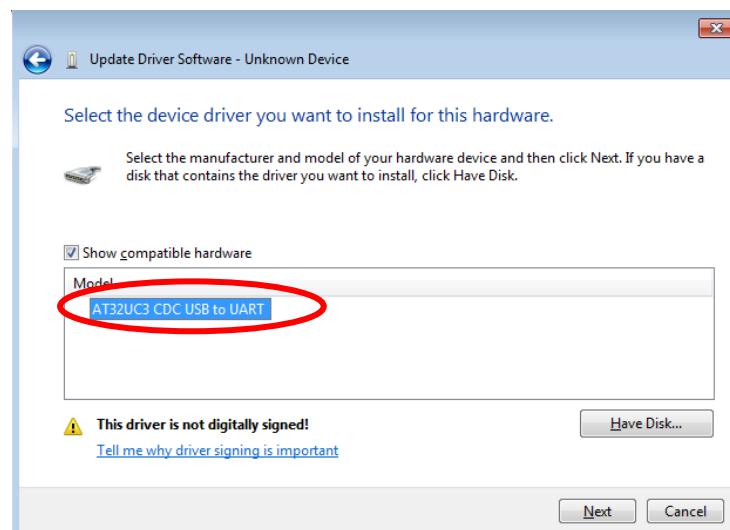
Step 8: Here you browse to the path „C:\Program Files\SPIKE BTKaBlue V 13.4 DE\Driver“ and choose there the driver. Next click on „Open“(s. following illustration).



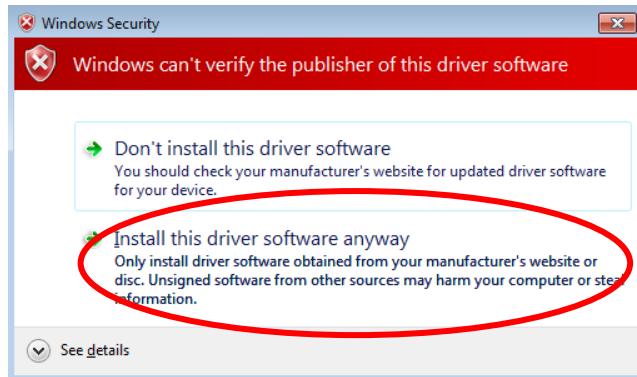
Step 9: Click the on „OK“(s. following illustration).



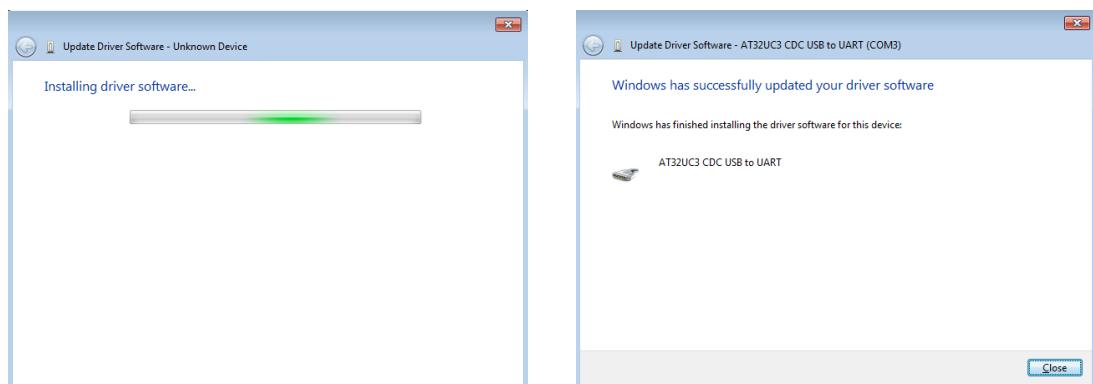
Step10: Now choose „AT32UC3 CDC USB to UART“(s. following illustration) and click next on „Next“.



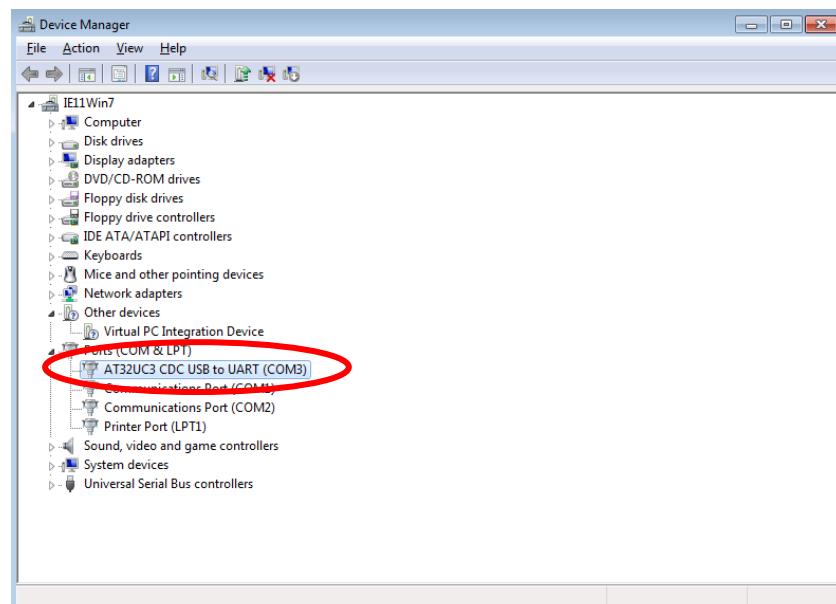
Step 11: A message appears now. Here choose „Install this driver software anyway“ (s. following illustration).



Afterwards the driver installation should start automatically.



After the installation process READ should be known as „AT32UC3 CDC USB to UART“ (s. following illustration).



12 Measurement

12.1 General annotations

The tool holder can be used just like a tool holder without sensors. Because of the sensory array, two possible issues may arise:



ATTENTION: Depending on the version of the tool holder, the use of an automatic tool changer may not be possible. Before a tool changer is used, it must be checked whether the geometric dimensions and the position of the ring are suitable for an automatic tool changer on the respective machines.



CAUTION: The maximum allowable speed is limited by the structure and the maximum possible sampling rate.

12.2 Preparation

- Place the Read in front of the viewing window of the machine. There should be preferably a direct line of sight to the tool holder in order to ensure an optimal transmission of data.
- Connect your laptop with the Read. Ensure the antenna is attached prior to connection.
- Activate the holder (manually or in the machine)
- Check the LED lights on the Reader whether the SPIKE® and the READ are connected. Yellow or green lights are shining. The SPIKE® and Read are not set to the same radio channel if only a blue and red LED light shine. In this case, press the button next to the light-emitting diodes to enable the Read searches the active channel of the holder and connects (see 3.1.3).

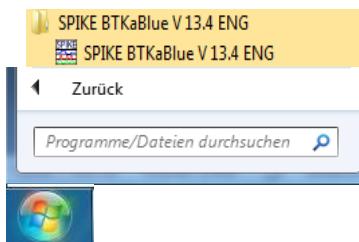
12.3 Software handling

12.3.1 Program start

To start the program, double click on the SPIKE®-icon on the desktop



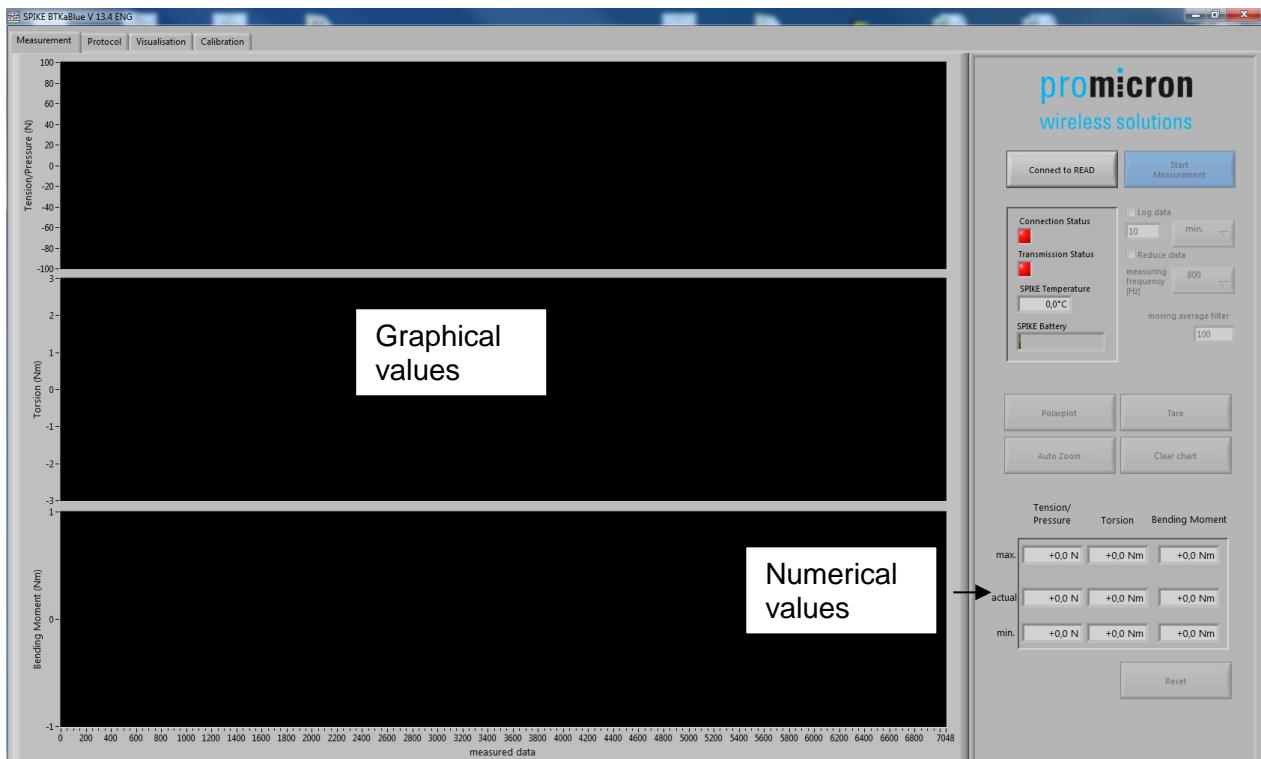
or from the Windows Start Menu.



Alternatively you can start the software from the installation path „C:\ProgramFiles\SPIKE® BTKaBlue V 13.4 DE\SPIKE BTKaBlue V 13.4 ENG.exe“.

12.3.2 Measurement

The „Measurement“ is in service of online visualization measured data, which is sent from READ (transferred from SPIKE® over READ to PC). The software displays the data as graphical and as numerical values. The user can also log data for using in “Protocol” mode or “Visualization mode” later.



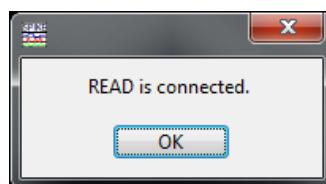
Connect software with READ

Before getting the software in use, READ must be connected with the PC and its driver must be installed.

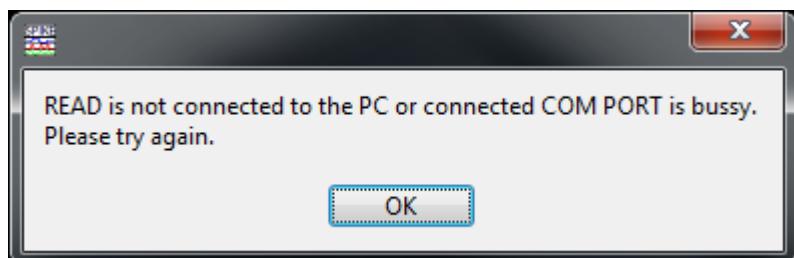
To install the READ driver, please see “4 Start up -> 4.5”.

Click the button „Connect to READ“ to establish a connection with READ. The software will automatically search for a plugged in READ. Afterwards, it will show you a connection status.

The following prompt will be shown when READ was found and the connection was successful:



The following prompt will be shown when READ could not be found or a failure occurred:

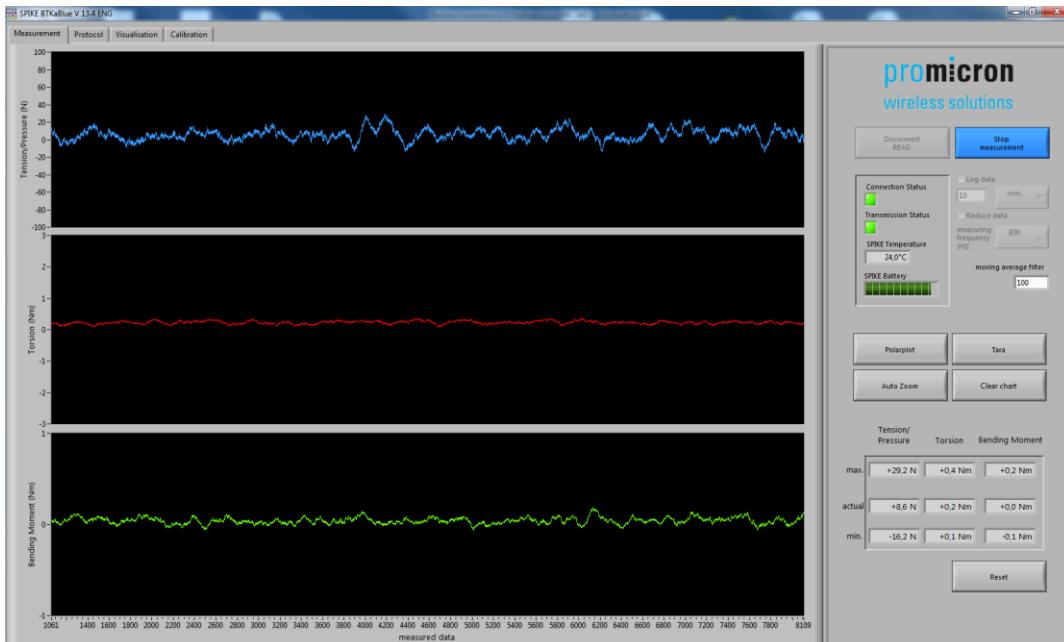


After a successful connection you will be guided to the „Calibration mode“ (s. 5.1.3).

- ① Before you start a measurement, the calibration values should be loaded from SPIKE® in the program.

Start/Stop measurement

To start measurements (after the software was successfully connected with READ) just click the button “Start Measurement”. If SPIKE® is active (green LED flashing), you should see the measured data immediately graphically as well as numerically. Otherwise please check the SPIKE® activation status. Furthermore, if you could not see any data, please check the connection status on the software. A red light signals no receiving data.



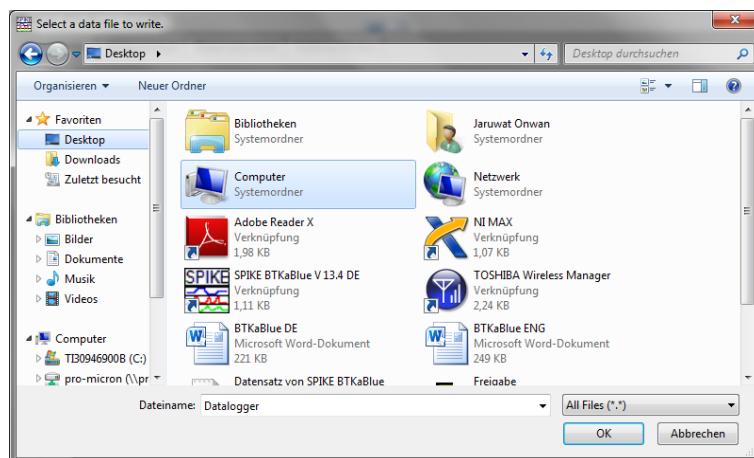
	Start measurement
	Stop measurement
	<p>Connection status:</p> <p>“green”: no failure with connection</p> <p>“red”: failure with connection → check SPIKE → check signal intensity</p>

- ① The software shows only the last 15 sec. measured data. You should better log it to visualize later in “Visualization mode”.

Log data

Make a checkmark in front of the “Log data box” and set subsequently the log time to log the data.

Afterwards when you start the measurement you will be prompted to give a name for data file and its location (s. following illustration).



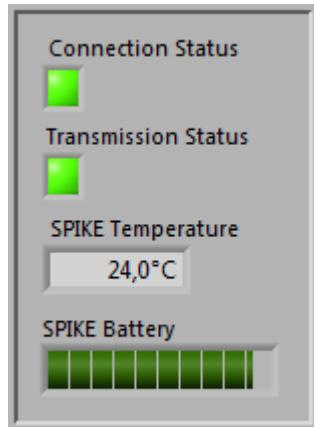
The measurement starts then.

- ⓘ Before logging you should level the values via the tara button.

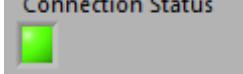
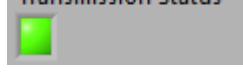
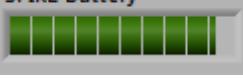
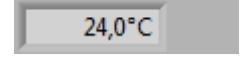
	<p>Tick the box in order to log the data. The time format can be chosen by selecting log-time using the dropdown (minutes or seconds). The recording will finish automatically, as soon as the log time is reached.</p>
	<p>The number of measured values can become very large, quickly during longer measurement periods. That's why it is recommended to reduce the number of measurements being saved. So insert a tick in the box and select the number of measured values to be saved per second. The maximum value is 1600 and up to this induces no reduction. Info: The measurement rate without reduction amounts to about 1600 measurements per second, which sums up to equal about 6MB per minute.</p> <p> ⓘ Info: The reduction of measured values is achieved by an averaging filter. At 160 measurements per second, only 10 measured values are identified, which reduces the data amount by 90%.</p>

Information from the SPIKE®

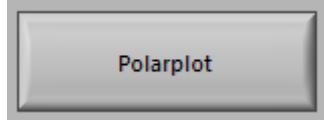
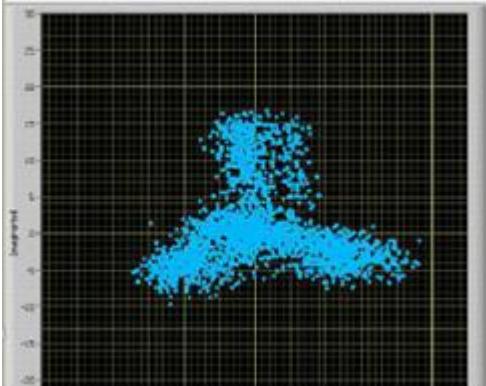
Information transmitted by SPIKE® can be read on the status field in "Measuring mode" window (s. below).

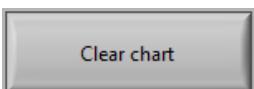
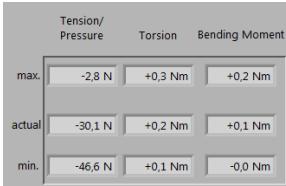
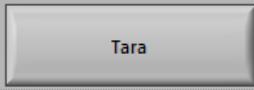
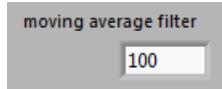
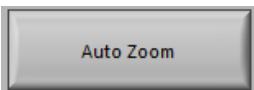


Indicator definitions:

 <p>Connection Status</p>	<p>Signal quality of radio transmission</p> <p>Displays the transmission quality between READ and SPIKE®. Try to keep the signal strength well (e.g. short distance between READ and SPIKE®) to avoid data loss.</p> <p><i>“green light”</i>: signal quality strong</p> <p><i>“red light”</i>: signal quality poor</p>
 <p>Transmission Status</p>	<p>Transmission-status diagnostic lamp:</p> <p><i>“green light”</i>: no transmission error</p> <p><i>“red light”</i>: transmission error → check SPIKE® → check signal quality</p>
 <p>SPIKE Battery</p>	<p>battery charge status</p> <p>Indicates the charge status of the battery. SPIKE® operates in the voltage range between 3.6V and 4.2V. This means 4.2V corresponds to a value of 100 %, and 3.6V to 0%. One bar corresponds to a value of 10%.</p>
 <p>SPIKE Temperature</p> <p>24,0°C</p>	<p>Temperature display</p> <p>Displays the temperature in the measuring system. At a temperature above 50°C (122 F), the display begins to flash red to warn against damage by excessive temperature. If the temperature continues to rise, SPIKE® needs to be cooled.</p>

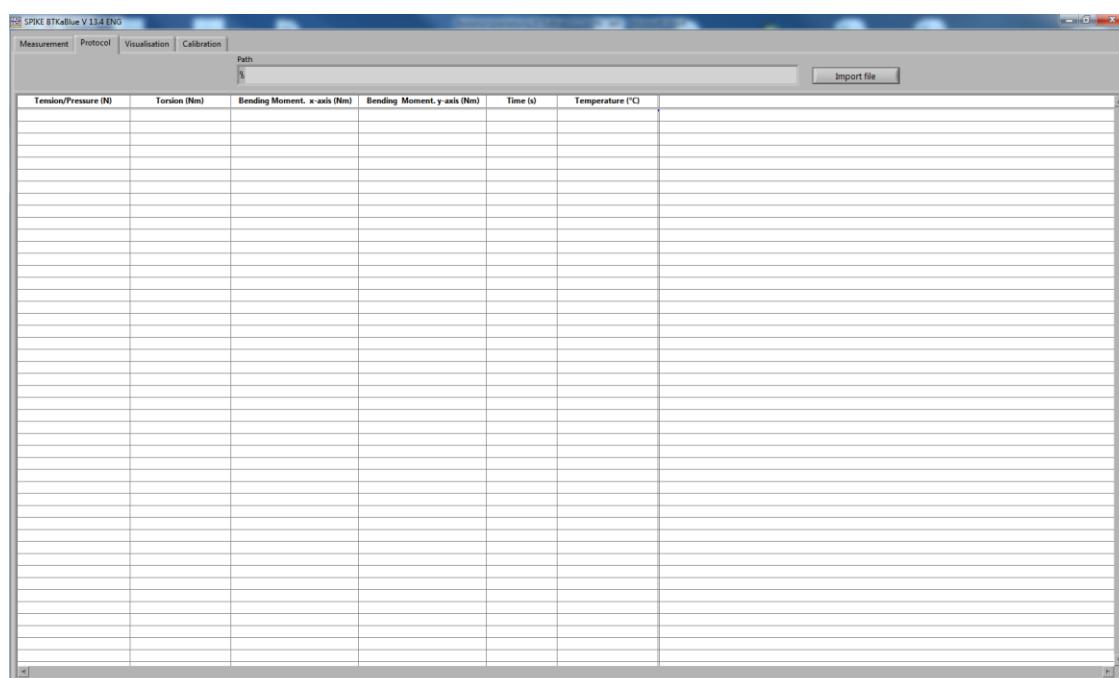
Other features in the „measuring mode“:

	<p>Polar Plot diagram</p> <p>Displays the bending moments in x and y direction in the rotating coordinate system. The diagram is useful for checking for example the quality of the tool's cutting edges. The Polar Plot will only be shown during measurement. (You can analyze the Polar Plot in the Tool Analyzer Software)</p>
	<p>Number of points of measurement, displayed in the Polar Plot</p> <p>Choose an appropriate number of points of measurement, for example for cut recognition. A tool at high speed requires more points, in order to recognise all cutting edges. This reduces the rate of measuring. A smaller rotation speed requires less points of measurement. (the maximal number of points is 2500)</p>
	<p>Example: The Polar Plot diagram of a tool which is not engaged.</p>

	Deletes the current view in the graph
	Resets the numerical min/max values in 
	Selects a new zero point (offset adjustment)
	Number of points for the sliding filter
	Use this button for automatic scaling of the graph's x- and y-scale The user can also create the scaling manually by clicking on the scale with the mouse pointer and typing in a value directly.

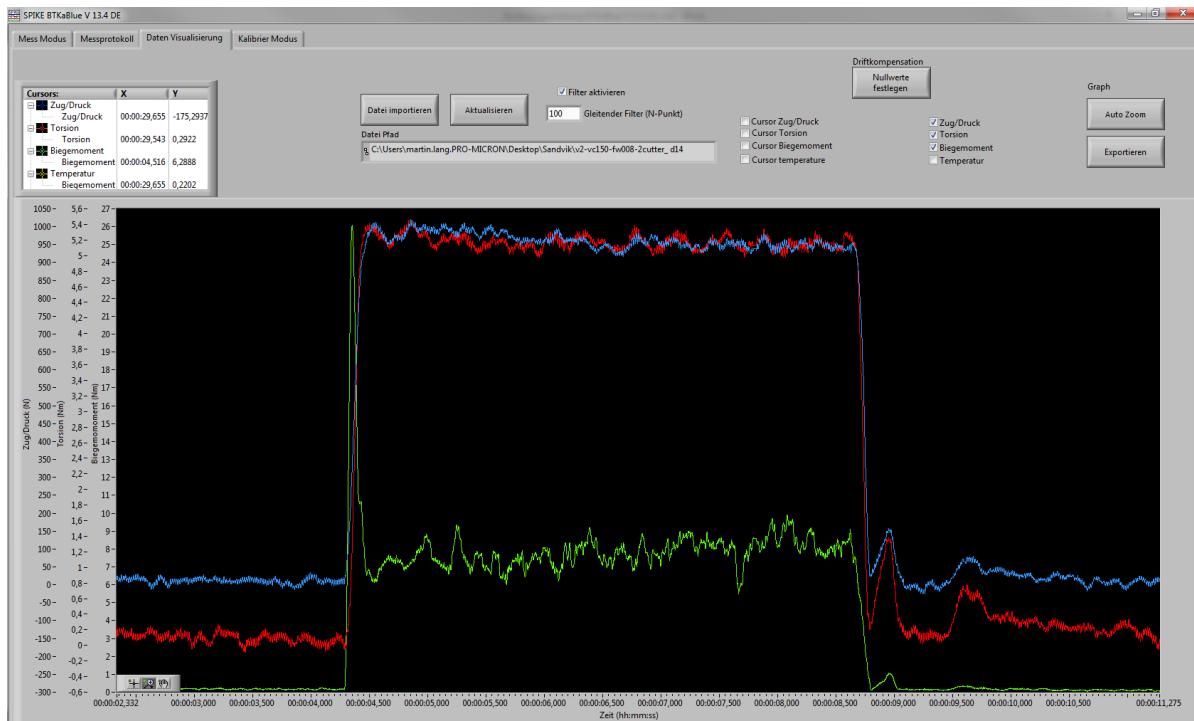
12.3.3 Protocol

After the data have been logged, they are transferred into the measurement protocol. By choosing 'import file', the user can also load measurement protocols saved before.



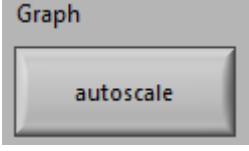
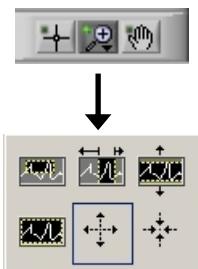
12.3.4 Visualization

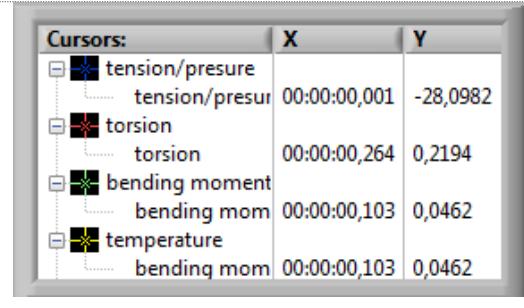
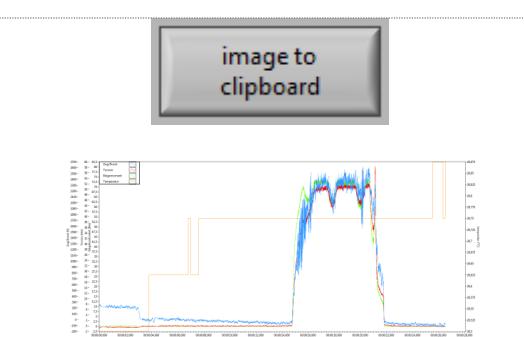
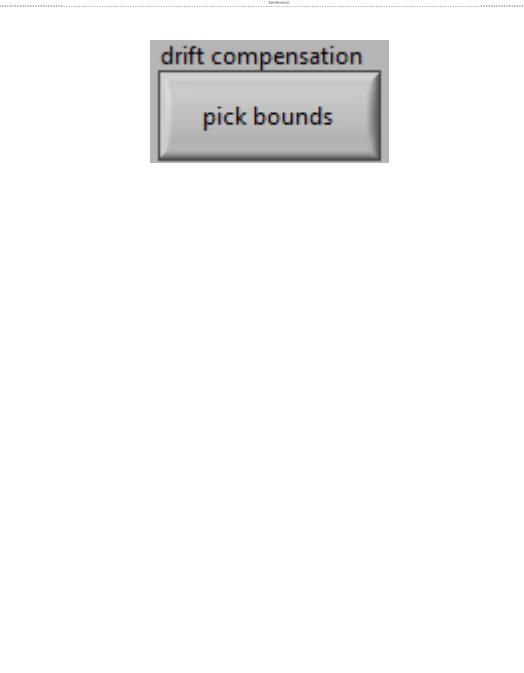
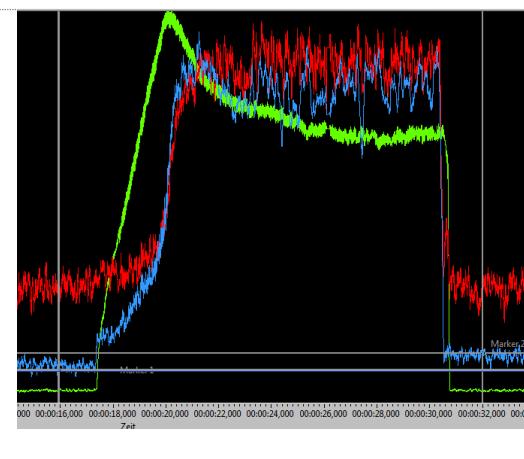
If collected data is logged, it is displayed automatically under the “visualization“- window using a graph. The data are shown over the actual time measured (“log time“) and therefore allows a time analysis of the data. The user can also load measurement protocols saved before by choosing the function “import data“ and can analyse it graphically.

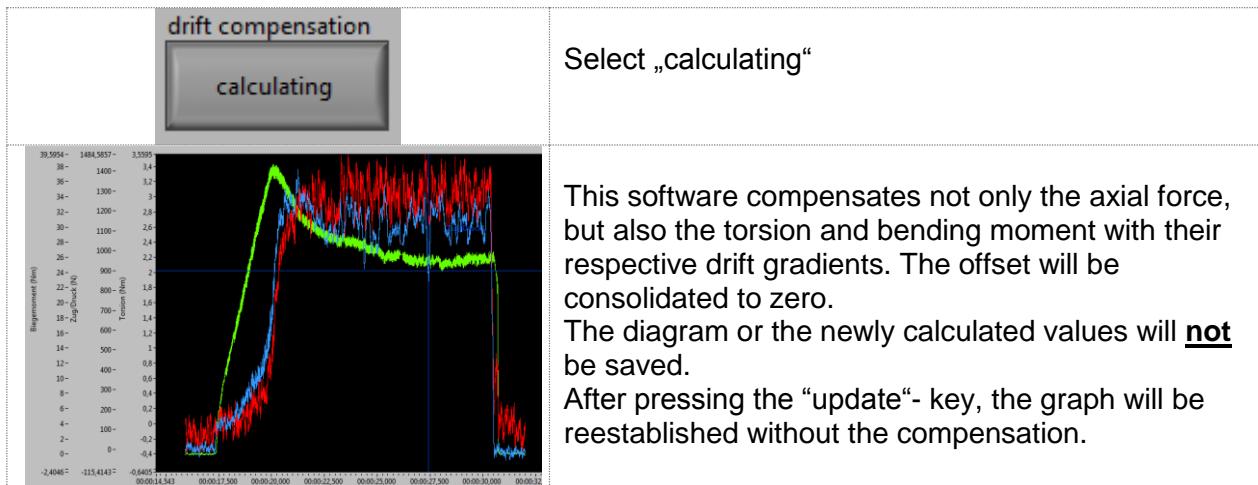


Following functions are available under “visualization“.

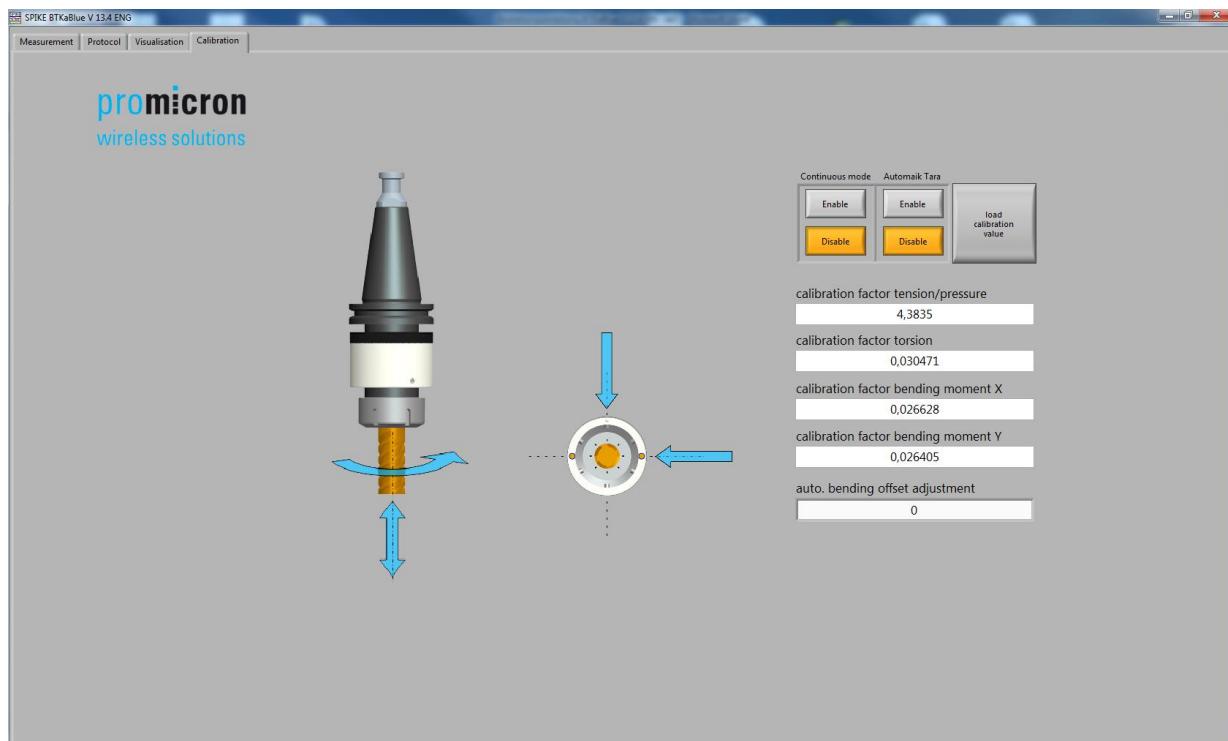
 <input type="text" value="path: C:\Users\Jaruwat.Onwan\Desktop\Datlogger.txt"/>	Imports a measurement protocol. The path shows the loaded measurement protocol's name and path. The most recently chosen path is saved during the session
	Press the “refresh” button, if you have changed options so that they can become effective. (e.g. filter, hiding plots)
<input checked="" type="checkbox"/> tension/pressure <input checked="" type="checkbox"/> torsion <input checked="" type="checkbox"/> bending moment <input checked="" type="checkbox"/> temperature	The user has the option to show or hide particular plots. A check mark activates the filter.

	<p>Type in the number of points for the moving average filter</p>
	<p>Use the button for automatic scaling of the graph's x- and y- scale. The user can also continue the scaling manually, by clicking on the scale with the mouse and typing in a value directly.</p>
	<p>The graph range has following fields (from left to right): Cursor: Moves the cursor on the graph. (works only in the "visualization" window) Zoom: Zoom function for the graph Hand: Takes hold of the plot and allows its movement.</p>
	<p>Press the Zoom button and choose between the following options (clockwise, from top left)</p> <p>Zoom square Choose a square window, that you want to zoom on to. X-Zoom Choose this option in order to zoom to an area of the x- scale. Y-Zoom Choose this option in order to zoom to an area of the y- scale Zoom in on one point Choose this option in order to zoom in on to a selected point. Press and hold the <i><Shift></i>- key for changing between zooming in and out. Zoom out of one point You can zoom out of one point with this option. Zoom automatically This option serves for an automatic scaling on the x- and y- scale on the graph.</p> <p>cursor tension/pressure cursor torsion cursor bending moment cursor temperature</p> <p>Activates cursor for different force components.</p>

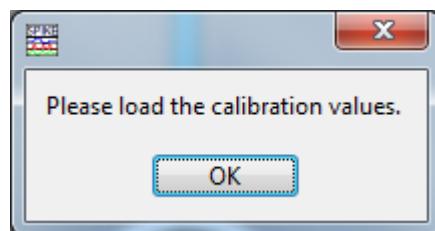
 <table border="1"> <thead> <tr> <th>Cursors:</th><th>X</th><th>Y</th></tr> </thead> <tbody> <tr> <td>tension/presure</td><td>00:00:00,001</td><td>-28,0982</td></tr> <tr> <td>tension/presur</td><td>00:00:00,264</td><td>0,2194</td></tr> <tr> <td>torsion</td><td>00:00:00,103</td><td>0,0462</td></tr> <tr> <td>bending moment</td><td>00:00:00,103</td><td>0,0462</td></tr> <tr> <td>temperature</td><td>00:00:00,103</td><td>0,0462</td></tr> </tbody> </table>	Cursors:	X	Y	tension/presure	00:00:00,001	-28,0982	tension/presur	00:00:00,264	0,2194	torsion	00:00:00,103	0,0462	bending moment	00:00:00,103	0,0462	temperature	00:00:00,103	0,0462	<p>The cursor display shows the values (time and force) of the current cursor position. With a right-mouse-click on the cursor's name, the cursor can be brought into the middle of the graph.</p>
Cursors:	X	Y																	
tension/presure	00:00:00,001	-28,0982																	
tension/presur	00:00:00,264	0,2194																	
torsion	00:00:00,103	0,0462																	
bending moment	00:00:00,103	0,0462																	
temperature	00:00:00,103	0,0462																	
 <p>image to clipboard</p>	<p>By selecting "Export Image", the current graph will be placed in cache-memory. The graph can be copied into every file chosen (e.g. Word file), by using the windows command "Paste". The graphs are displayed on a white background.</p>																		
 <p>drift compensation</p> <p>pick bounds</p>	<p>By using the button "drift compensation" it is possible to compensate a drift (caused by temperature) in signal or a signal's inadequate "tara" before the measuring starts. During the compensation calculation, the program acts on the assumption of a linear drift development.</p> <p>Function: Using 2 markers associated to the axial force curve, the points illustrating the zero value can be defined manually before and after the processing (i.e. the points without influence of forces developed by the machining operation). For the radial axial force, torsion and bending moments, the program identifies the distance of the first point to the zero point and the theoretical drift gradient up to the second marked point. It then compensates these for these values to the signals. The newly calculated values will not be saved.</p>																		
	<p>Process: After pressing the switch, two grey crosses of lines will appear (marker 1 and marker 2), that can be placed at the theoretical zero value with the mouse, before and after the machining.</p> <p>(For moving, the symbol  cursor has to be activated) Marker 1 has to be placed in front of Marker 2! The program averages in front of the line by using the adjusted number of measurement values from the filter. The program develops the compensation calculation from this value.</p>																		



12.3.5 Calibration

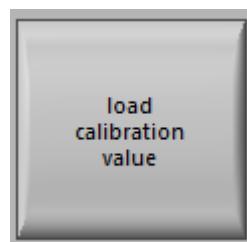


Your SPIKE® has to be calibrated first, before the actual force working can be displayed properly. You will be advised to do so after restarting the software, as soon as the receiver has been connected.

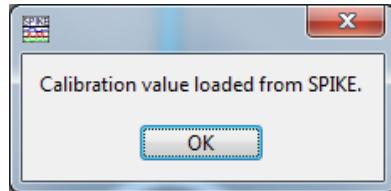


With the “Calibration” the user can (re)calibrate the SPIKE®. For this it is possible to record calibrating factors directly into the destined fields, so that the calculated values equal the forces working on the holder.

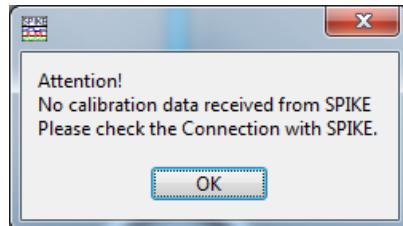
An easier solution is to read the values directly from the SPIKE®. In order to transfer the deposited calibrating values into the software, press the “load calibration values” button, **while the SPIKE® is activated**.



The receiver will read the SPIKE's® calibration values automatically and copy them into the appropriate fields. The following message appears afterwards giving user the processing status:



If an error occurs:



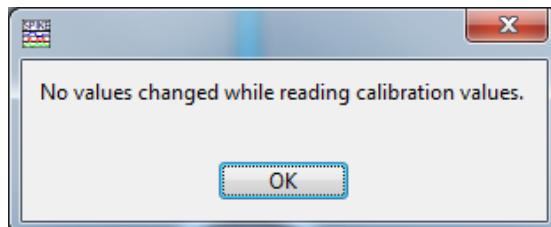
The automatic bending moment offset comparison will only be updated after the measurement's initial start.

- ⓘ If the error occurs more than two or three times, you should check the connection between READ and SPIKE® again. Doing this by checking the activation status of SPIKE®. The LED on it should be flashing green. On READ you should see a blue LED flashing and the LEDs on the second line all green. If this isn't the case please push the reset button on READ to connect with SPIKE® again.

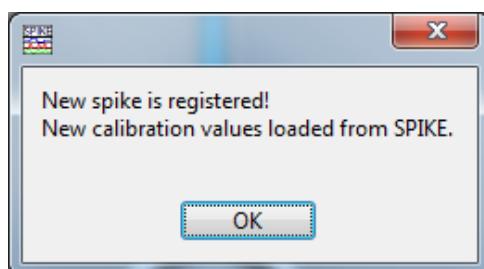
If you have more than one SPIKE® on your hand you can also change. By clicking again on the button "Load calibration value" the software will check this automatically.

- ⓘ The other SPIKE® must be turned off when a new one is turned on.

This message will prompt when you click on „Load calibration value“ without changing SPIKE®.



This message will prompt if another SPIKE® is registered.



Automatic Tare:

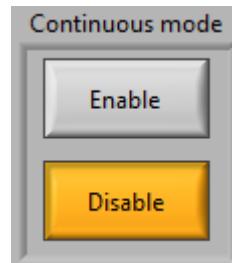
In order to avoid the manual tare before each measurement, you have the option to activate "Auto.Tara". In this case each time a measurement is started (when pressing the button "Start measurement") tara will be carried out automatically. This process takes about 3 seconds each.

By default, "Auto.Tara" is disabled.



Continuous run:

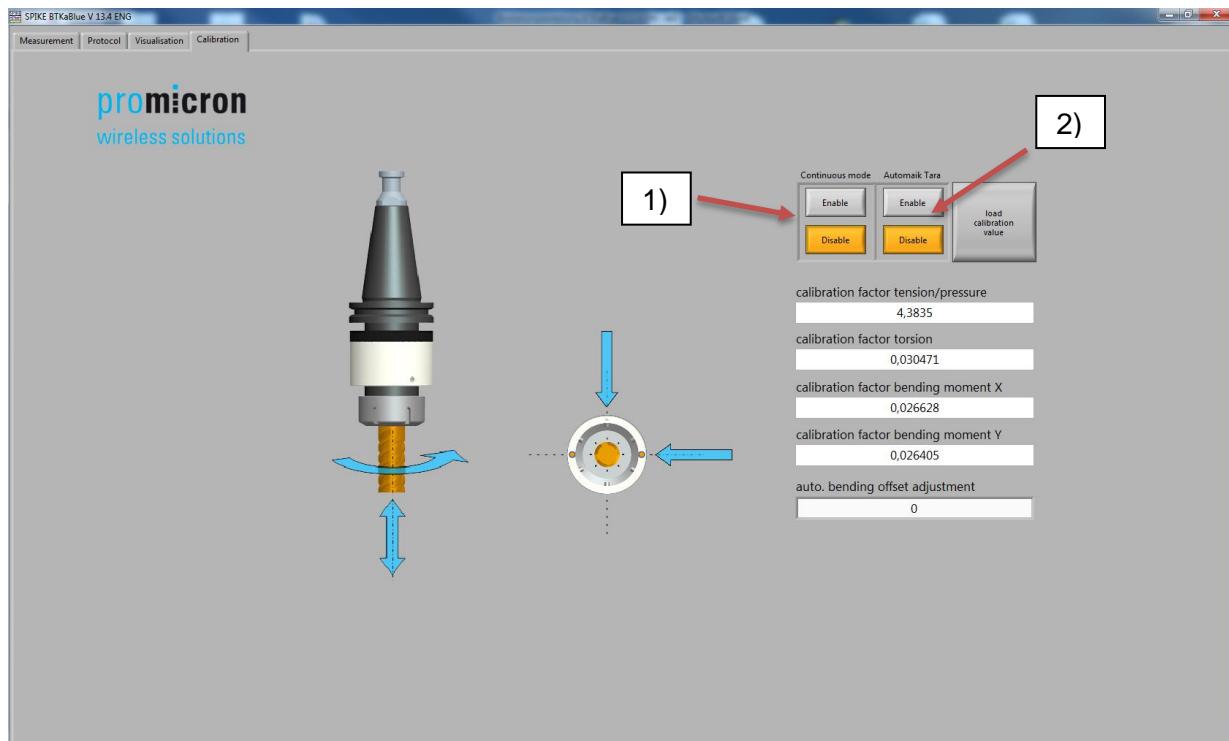
To prevent a shut down of the SPIKE® (e.g. in processes with low rotation speed like threading), the mode "continuous mode" can be activated. In this case SPIKE® continuously transmits data and does shut down .



ATTENTION: Before closing the BTKaBlue software the set of "continuous mode" must be deactivated again, as the SPIKE® otherwise continues to discharge.

12.4 Measurement example

12.4.1 Measurement preparation

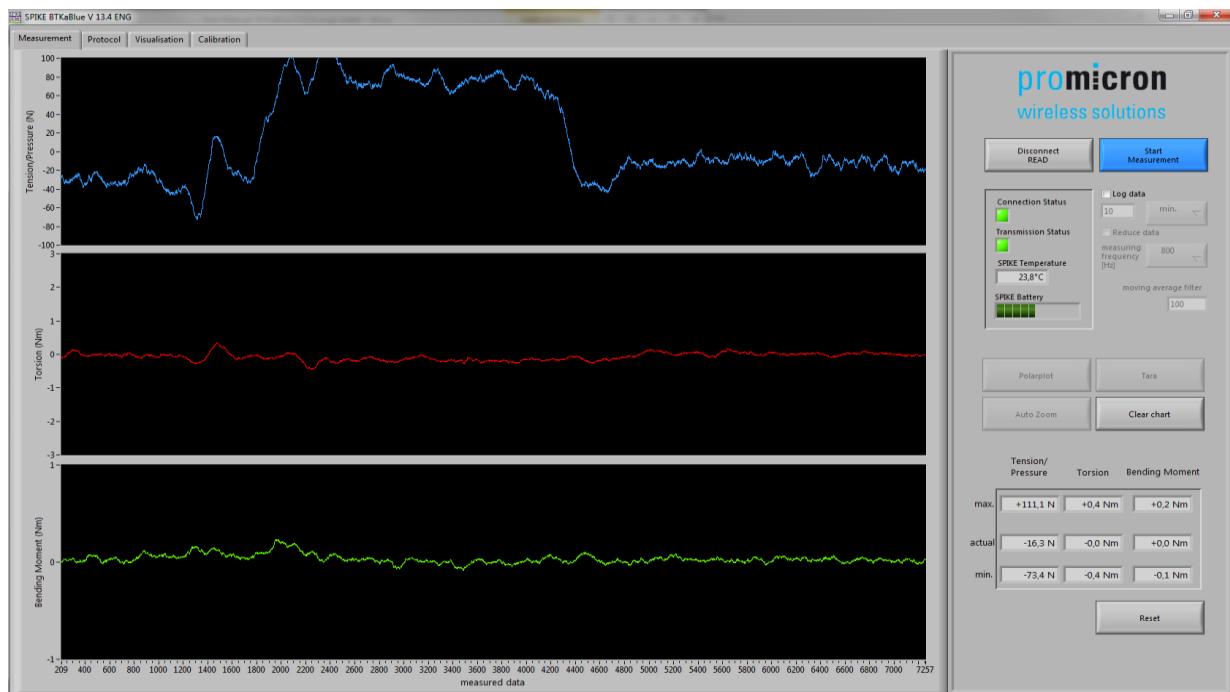


1. Before starting the measurement, it is necessary to decide whether you want to operate the SPIKE® in "continuous mode", for continuous operation, or whether the sensory tool holder should turn off automatically after each measurement.

In our example the "continuous mode" is disabled.

2. Furthermore, it is necessary to determine whether SPIKE® should automatically tare each new measurement at startup. For this operation, the system requires approximately 3 sec each.

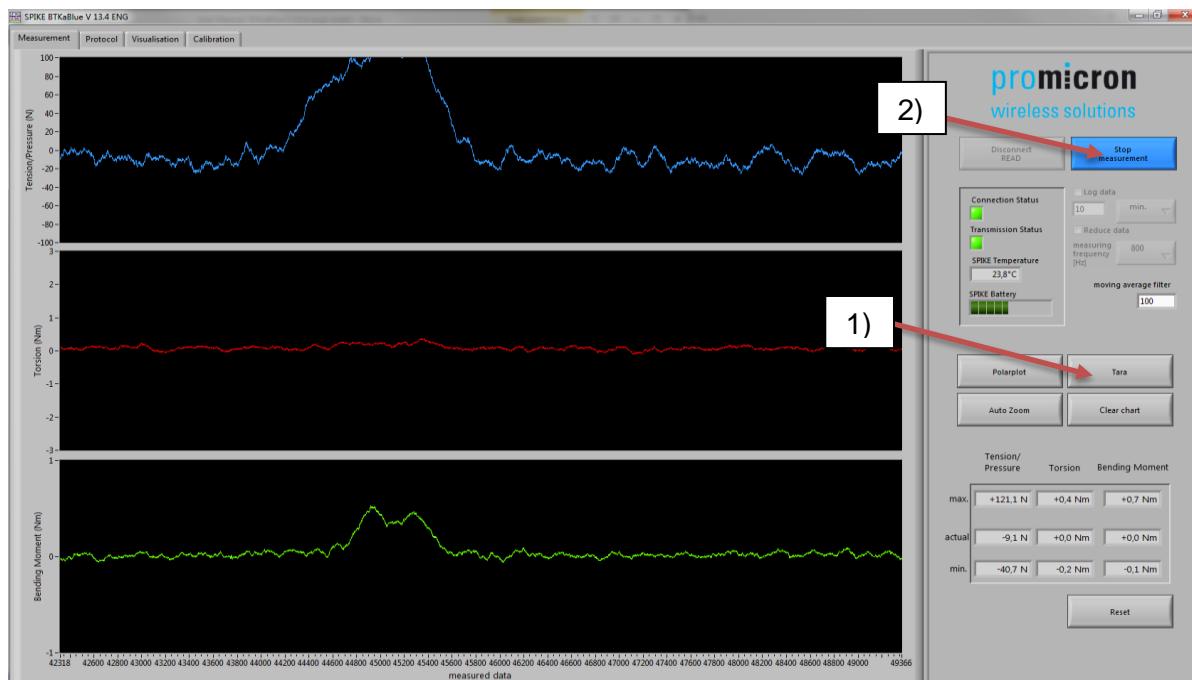
In our example „Auto. Tara“ ist disabled.



Before you can start a measurement, it is firstly necessary to tare the SPIKE® on the current conditions (speed, coolant pressure...), so to zero the offset (Tara has a similar function as the kitchen scale).

Then you have to wait for the lines axial force, torsion and bending moment to be balanced.

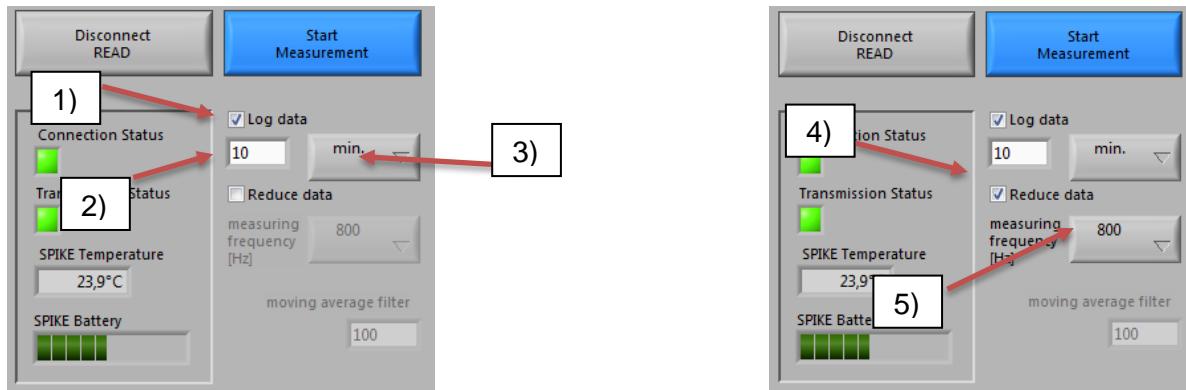
- ① If there is a temperature difference between the holder and cooling lubricant, it is advisable to let rotate the holder with coolant before the first measurement. This may take a few minutes to complete.
- ① Any remaining forming drift can be eliminated by the software.



Now press the button "Tara" (1). Then press "Stop measurement" (2)

12.4.2 Measuring

To start a measurement, first set a hook in the box "Log data"(1).



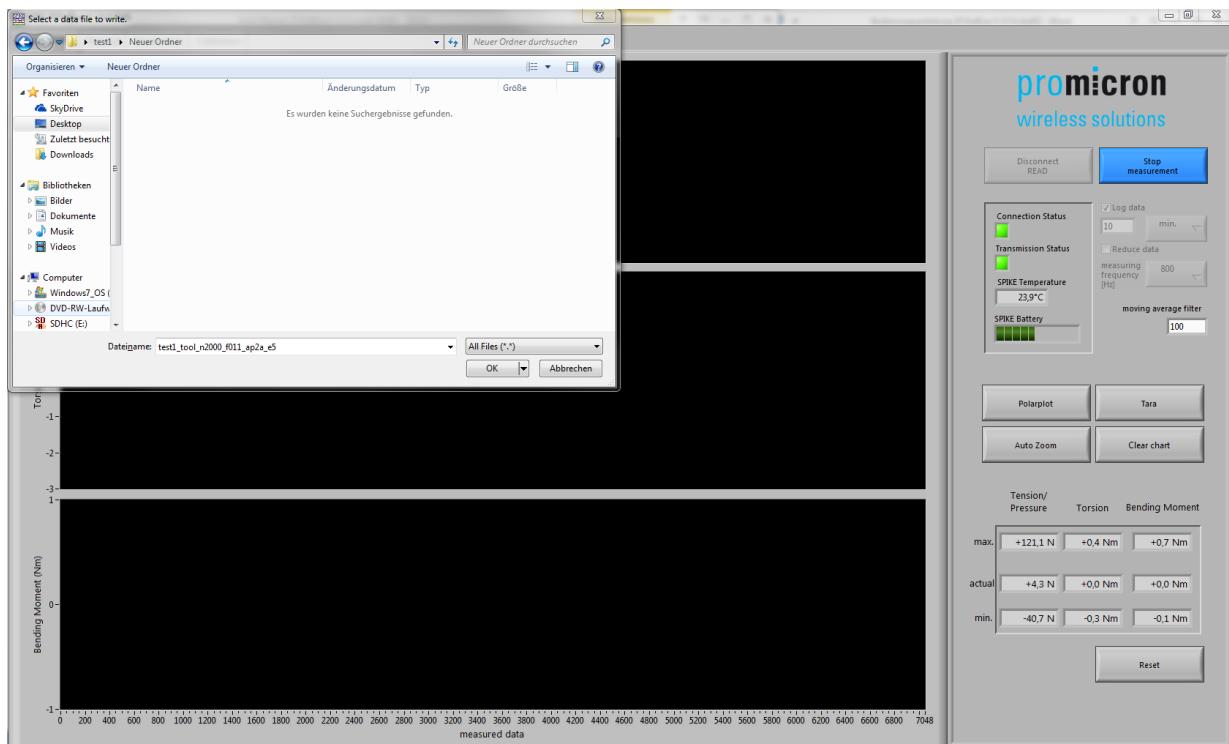
- ① Just below this box is a window that limits the maximum measurement time. If longer measurements are made, the time can be adjusted. (ATTENTION! Pay attention to the file size. 1 min is about 6.7 MB!) May reduce the sampling rate in this case.
- ② If only short periods of time are recorded, the unit of time can also be converted to seconds.
- ③ If the measured values should be reduced during the recording, put a hook next to "Reduce data" (4) and select the appropriate reduction (5).

Now you can press the Start-button to begin the measurement.

Then a window opens in which you are prompted to enter a file name.

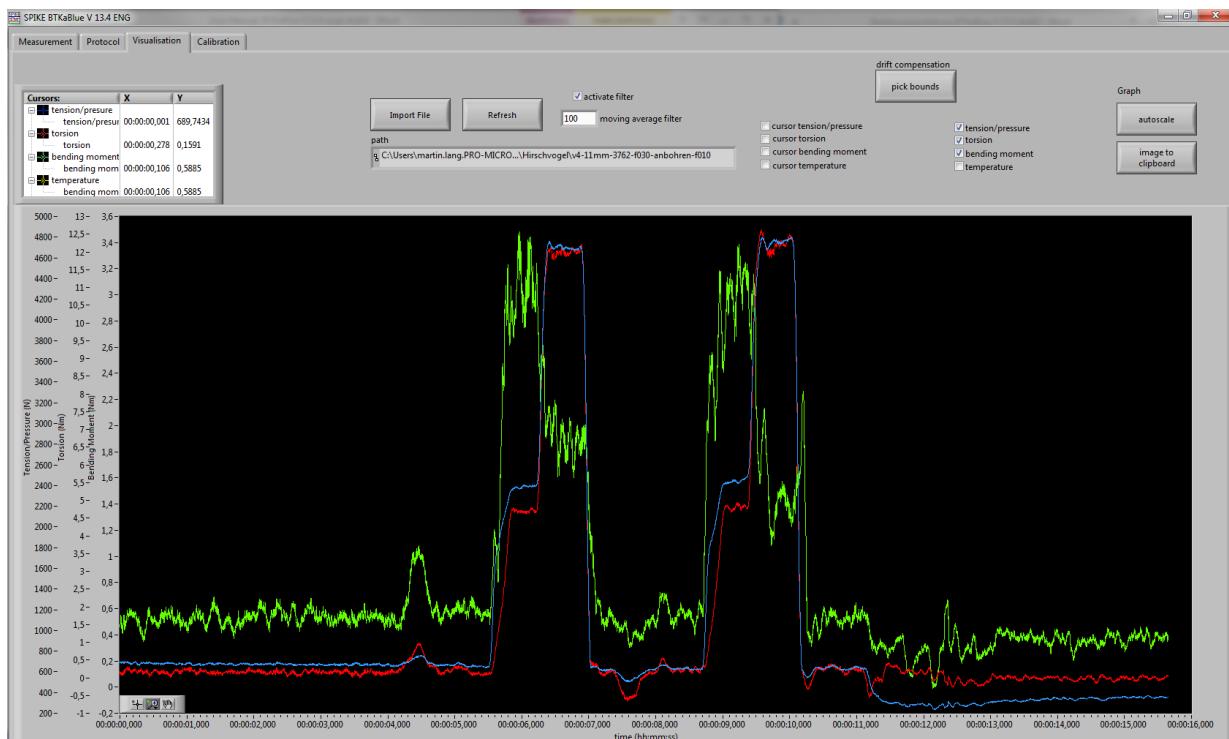
HINT: Enter a file name that is meaningful and helps the identification of the readings later.
Do not use commas or periods for feature separation:

(e.g. test1_tool_n2000_f011_ap2a_e5)



By pressing the OK button, the measurement starts automatically.

Stop the measurement with "Stop measurement" or automatically by setting a time limit. Then the data can be viewed over the entire measurement period in the window "data visualization". A comprehensive analysis of the data can be best provided with the Tool Analyzer software (optional).



ATTENTION: Before closing the BTKaBlue Software the continuous mode has to be switched off. Otherwise SPIKE® will be discharged further on

13 Maintenance

-  ATTENTION: Oil the tool holder after use.
-  ATTENTION: To prevent deep discharge of the batteries and thus damage, the SPIKE® should be charged 1x per quarter.

14 FAQ's

Question	Answer
SPIKE® does not glow violet after putting on the charging station.	<ul style="list-style-type: none"> The contacting between SPIKE® and the charging station is not properly made. Put the SPIKE® again on the charging station and make sure that the measuring ring is completely seated on the charging station. Check the correct fit of the individual connectors on the charger and the AC adapter.
Why is the signal not stabilized even if I already pressed "tara"?	<p>As long as the temperate or anything else is changing you will not get a level signal even if you press tara. This effect can be seen mainly in axial force direction. Further more the signal drift can be caused from the specific mechanic of the tool holder. (e.g. through the expansion of the hydraulic oil of a hydraulic tool holder.)</p> <ul style="list-style-type: none"> Particularly when starting measuring wait some moments till signal has been stabilized – push again "Tara" button afterwards. Generally the drift of the signal can be compensated with the Tool analyser software when analyzing the results.
There is a torsion and a tension signal but no bending when measuring. What to do?	<ul style="list-style-type: none"> Reload the calibration data.
When starting measuring the tension/torsion/ bending stays zero.	<ul style="list-style-type: none"> Make sure the calibration data is loaded properly.
In the measurement it happens that flat lines occur. Why?	<ul style="list-style-type: none"> This can happen because the connection between the SPIKE® and the receiver is bad. Change the position of the receiver and watch the strength of the signal!
The SPIKE® isn't turning on even if it is spinning in the machine, why?	<ul style="list-style-type: none"> How fast is the SPIKE® spinning? It needs at least about 300 rpm. If so please activate the continuous mode The SPIKE will not switch off after measuring.
The signal strength of the SPIKE® is bad. How make it better?	<ul style="list-style-type: none"> Minimize the distance between SPIKE® and Receiver. Try to have a direct link between SPIKE® and Receiver with no objects in between. Try to turn out other devices which may affect the signal.

15 Uninstall software

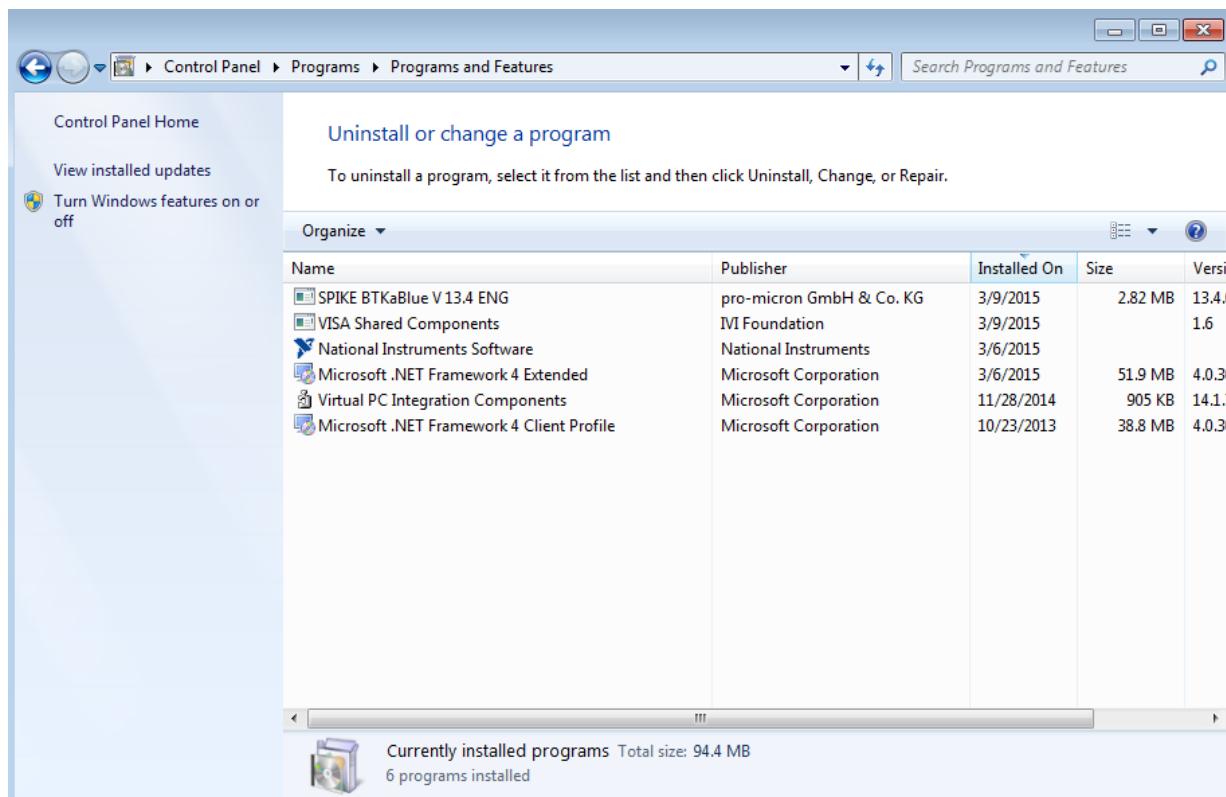
15.1 Uninstall SPIKE® BTKaBlue V 13.4

To uninstall the software completely from your system please follow the steps below.

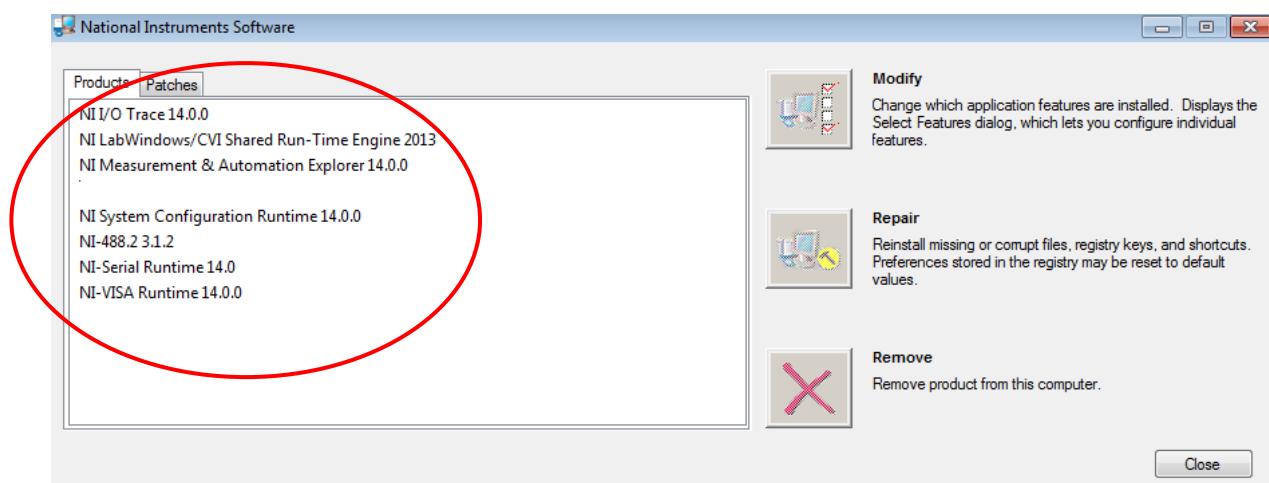
Step1: Double click on “**National Instruments Software**” (s. following illustration).

To do this, go to:

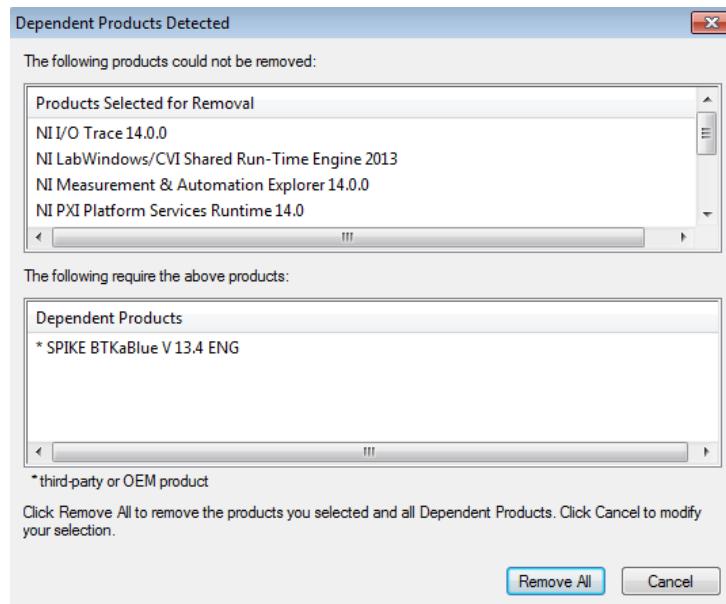
Windows Start menu → Control panel → Uninstall a program



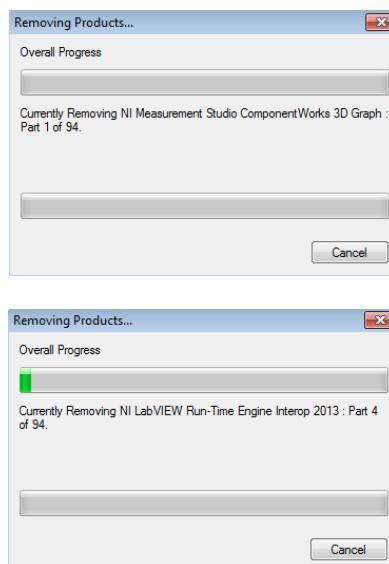
Step 2: Select all components in this following windows and then select „Remove“.



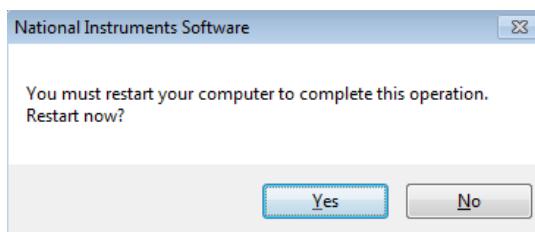
Step 3: Click on „Remove All“.



The uninstallation process starts automatically (s. following illustration).



Step 4: Restart your computer.



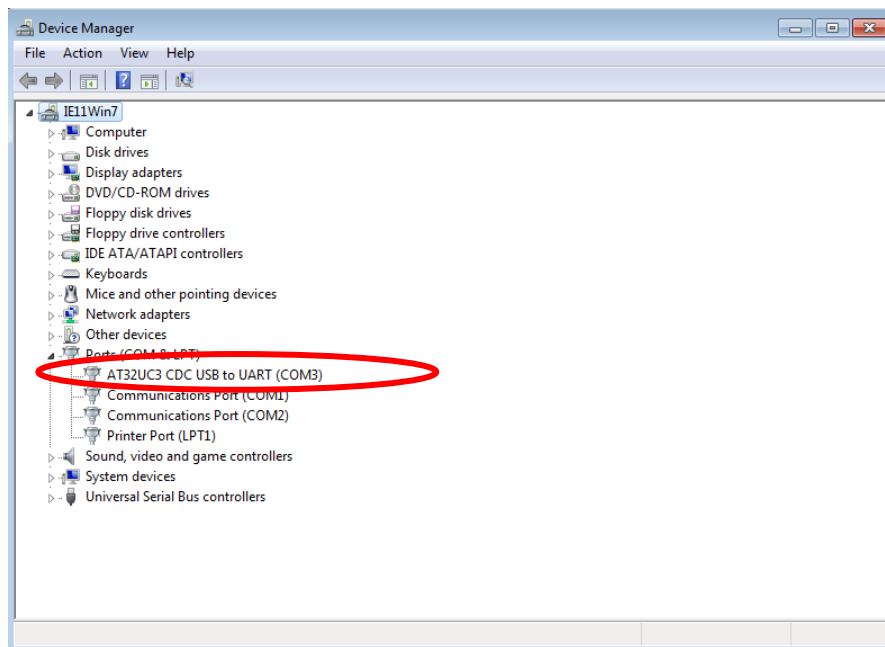
15.2 Uninstall READ-driver

To uninstall the READ-driver completely from your system please follow the steps below.

Step 1: Connect READ with your PC.

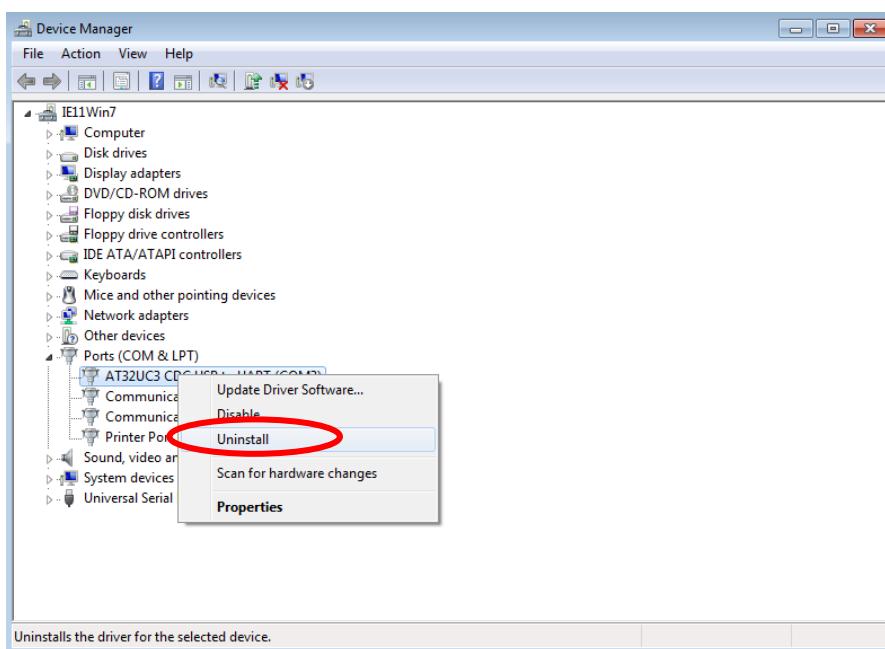
Step 2: Open the Device Manager (s. following illustration).

To do this, go to: Windows Start menu → right click on computer → select properties → choose Device Manager from the right register.



Under „Ports (COM & LPT)“ you should see „AT32UC3 CDC USB to UART“ (s. upper illustration).

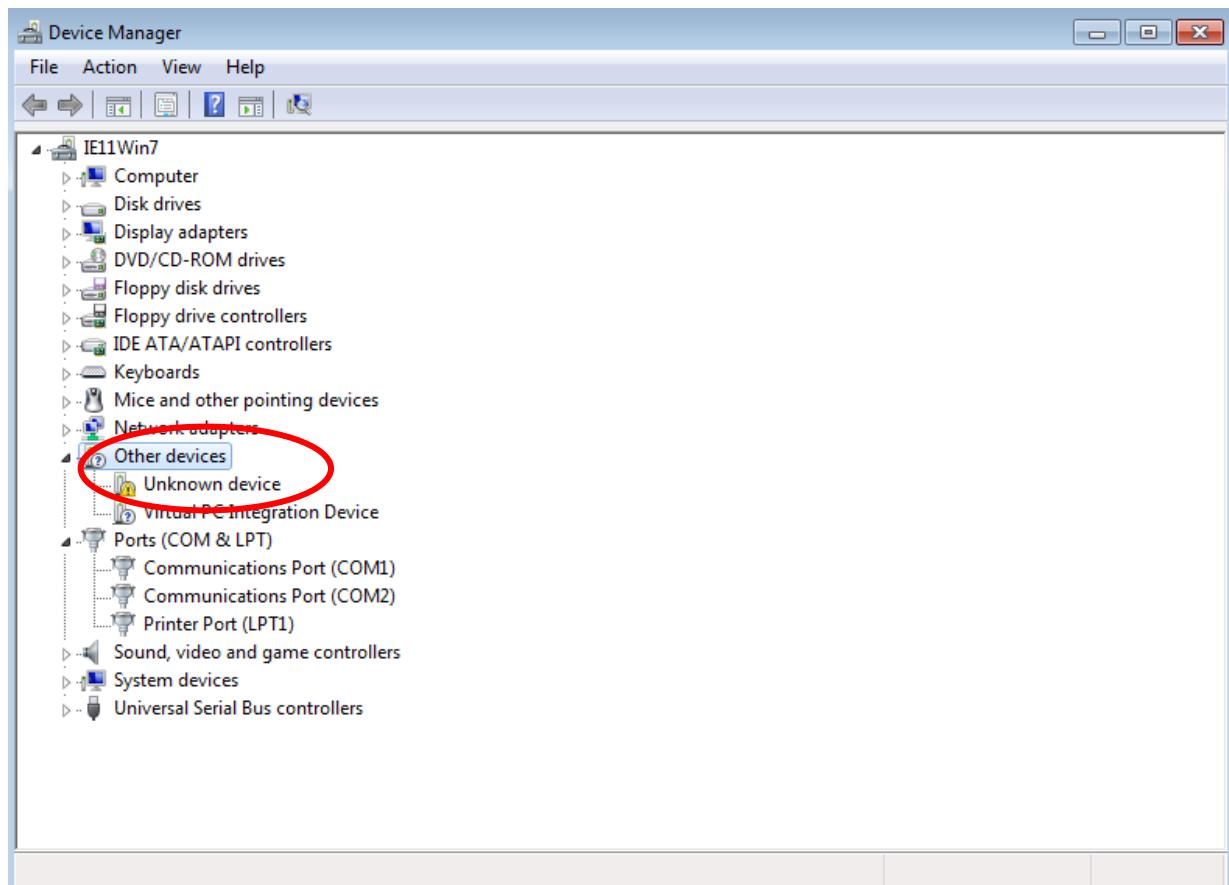
Step 3: Select „Uninstall“.



Step 4: Click on the box „Delete the driver software for this device“ and press „OK“.



Afterwards the READ-driver will be uninstalled from your computer.
In the Device Manager should show READ as Unknown device (s. following illustration).



Appendix

A Technical Data SPIKE®

Dimensions (holder specific)

Total length / sensor ring diameter
e.g.: SK 40 / 100 170mm x 63mm

Weight

Tool holder ~ 1,0 Kg
with sensors ~ 1,25 Kg

Voltage supply by charging station

Voltage 5 VDC
Current consumption max. 200 mA

Protection class

Sensor ring: IP66 / IPX7 in accordance to DIN EN 60529

Sampling rate

1600 1/s

Radio transmission

Frequency range: 2,45 GHz
Reach : a minimum of 2m

Max. speed:

18.000 rpm

Operating conditions:

Operating temperature 0...50°C (122F)
Storage temperature -10...60°C (140F)
Humidity 20...55% (not condensing)

LEDs on sensor ring:

red/blue LED:	glowing during the charging process
blue LED:	glowing, if charging process is completed
green LED:	glowing during the offset comparison flashing with the sampling rate during a measurement (is perceived as weaker glowing)

B Technical data READ

Dimensions

Length x width x height 136mm x 124mm x 36mm
(Receiver without antenna)

Protection class

Receiver: IP40

Power supply via USB

Voltage 5 VDC
Power consumption 150 mA

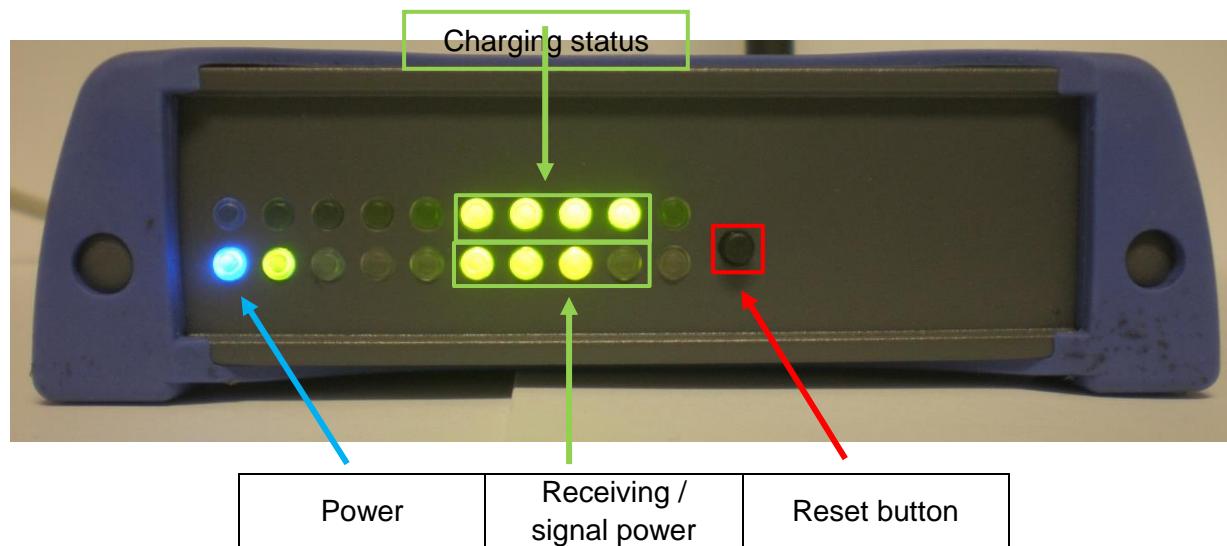
Radio transmission

Frequency range: 2,45 GHz
reach: a min. of 2m

Operating conditions

Operating temperature 0...50°C (122F)
Storage temperature -10...60°C (140F)
humidity 20...55% (not condensing)

Displays



Power:	blue, as soon as the Receiver is supplied with voltage
Receiving:	red, if no signal is received or signal errors occur green, if data is received
Charging status :	red, if battery is empty green, if battery is completely charged
Reset button:	To connect SPIKE® with Reader

Charging status:

	100% : completely charged
	70 %
	40 %
	0 – 25% : SPIKE® must be charged

Signalstärke:

	Very good signal quality
	Good signal quality
	Signal quality is ok → Reader receives data, but sent packets are lost increasingly
	Poor signal – minimize distance to SPIKE®

C Technical data charging station

Dimensions

<u>Charging station</u>	<u>Length x width x height</u>
Sensor ring diameter 60mm:	92mm x 92mm x 115mm
Sensor ring diameter 64mm:	92mm x 92mm x 116mm
Sensor ring diameter 75mm:	92mm x 92mm x 123mm
Sensor ring diameter 84mm:	112mm x 112mm x 115mm

Charge current

Voltage	5 VDC
Current consumption	max. 200 mA

Operating conditions

Operating temperature	0...50 °C
Storage temperature	-10...60 °C
humidity	20...55% (not condensing)

Protection class	IP 40
-------------------------	-------