Anton Paar

Measure
what is measurable
and make measurable
that which is not.

Galileo Galilei (1564-1642)

Instruction Manual and Safety Information

Nambicon

Non-AMBIent-CONtrol Software

(Original Instruction)

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Further information

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(Original Instruction)

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1 Safety Instructions

- Read this instruction manual and the instruction manuals of corresponding non-ambient attachments and control units before operation.
- Follow all hints and instructions contained in these instruction manuals to ensure the correct use and safe functioning.
- The documentation is a part of the product. Keep this document for the complete working life of the product and make sure it is easily accessible to all people involved with the product. If you receive any additions or revisions to the documentation from Anton Paar GmbH, these must be treated as part of the documentation.

1.1 General Safety Instructions

Liability

- This instruction manual does not claim to address all safety issues associated with the use of the instrument and samples. It is your responsibility to establish health and safety practices and determine the applicability of regulatory limitations.
- Anton Paar GmbH only warrants the proper functioning of Nambicon, corresponding non-ambient attachments and control units if no adjustments have been made to the mechanics, electronics, and firmware.
- Only use Nambicon, corresponding non-ambient attachments and control units for the purpose described in the instruction manuals. Anton Paar GmbH is not liable for damages caused by incorrect use.

Installation and use

- The installation procedure should only be carried out by authorized personnel who are familiar with the installation instructions.
- Make sure all operators are trained to use the instruments safely and correctly before starting any applicable operations.
- In case of damage or malfunction, do not continue operating Nambicon, corresponding non-ambient attachments and control units. Do not operate the instruments under conditions which could result in damage to goods and/or injuries and loss of life.

Precautions for highly inflammable samples and cleaning agents

- Ensure the sufficient supervision of Nambicon, corresponding non-ambient attachments and control units during operation.

1.2 Conventions for safety messages

The following conventions for messages are used in this instruction manual:

TIP: *Tip gives extra information about the situation at hand.*

2 Nambicon - An Overview

The Nambicon (Non-AMBIent-CONtrol) software is a control and service software for Anton Paar's non-ambient attachment hardware components. The software runs on Windows computers and communicates with the control unit (Combined Control Unit, CCU) connected to the non-ambient attachment or with the BTS 150/500 heating attachments.

Nambicon features a real-time line graph, which shows data such as temperature, humidity and power output.

The graph allows to directly evaluate the performance of the non-ambient attachment and appropriate control unit and displays the current status of the measurement. The service component of Nambicon provides an option for a firmware update on-site.

Nambicon is delivered with the control unit and can be used in addition to the control software of the diffractometer.

3 How to get Nambicon

Nambicon is delivered on a USB flash drive with the control unit. In case you do not have Nambicon on USB flash drive, please contact Anton Paar GmbH.

Contact details of Anton Paar GmbH:

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4 Preparing the Instrument

4.1 Hardware Requirements

The hardware requirements are guidance in choosing the right hardware for smoothly installing and running Nambicon. Hence, they are more like recommendations than real requirements.

- Intel(R) Core(TM) i3 CPU
- 4 GB RAM (depends on the operating system)
- Screen resolution of at least 1024 x 768 at True Color (32 bit), best experience with a monitor with an aspect ratio of 16:9 or 16:10
- Use of a dedicated graphics card that supports Direct X 9 is recommended
- 20 GB free disk space on system drive
- Mouse and keyboard

4.2 Software Requirements

Nambicon is built on Windows technologies and is only available for Windows operating systems. Thus, the list of supported operating systems depends on which operating systems are officially supported by Microsoft. Please keep in mind that the list of supported operating systems might change for future releases of Nambicon.

A detailed list of supported and unsupported operating systems is provided for your convenience.

Supported Operating Systems

- Microsoft Windows 7
  - 32 bit and 64 bit are supported
  - Service Pack 1 or later is required
  - Windows 7 Starter Edition is not supported
- Microsoft Windows 8
  - 32 bit and 64 bit are supported
- Microsoft Windows 8.1
  - 32 bit and 64 bit are supported
- Microsoft Windows 10
  - 32 bit and 64 bit are supported
- Microsoft Windows Server 2008 / 2008 R2
  - 32 bit and 64 bit are supported
  - Service Pack 2 or higher is required for Windows Server 2008

Unsupported Operating Systems

- Microsoft Windows 2000
- Microsoft Windows XP
- Microsoft Windows Vista
- Microsoft Windows Server 2003

4.3 Connecting the Control Unit

Connect the control PC via

- serial RS232 connection for CCU
- a USB connection for both BTS 150 and BTS 500

4.4 Power Options

You should configure your operating system's power options, so that your target machine does not go into sleep/standby mode or into hibernation after a few minutes of inactivity; otherwise Nambicon will not be able to continuously record measuring data.

5 Putting Nambicon into Operation

5.1 Installation of Nambicon

Before installing Nambicon read the system requirements as well as the release notes and check if hardware and software are suitable (see Chapter 4).

You must have administrator privileges to install Nambicon software.

TIP: *Contact Anton Paar GmbH, if you face any issues during installation.*

For the installation of NAMBICON proceed as follows:

1. Insert the delivered USB flash drive
2. Execute Nambicon_Setup_x.x.exe
3. Follow the instructions of the setup program. Confirm the "Download - Security Warning" if necessary (this depends on your windows configurations).

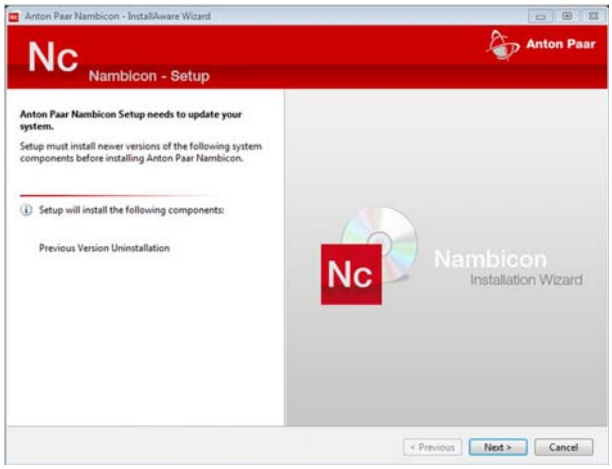

Fig. 1: Nambicon Installation Wizard

5.2 Uninstall Nambicon

To uninstall Nambicon proceed as follows:

1. Open the control panel and select `Programs and Features´
2. Locate Nambicon and select `Remove´
3. The installer will open and will guide you through the uninstalling process.

6 Graphical User Interface

The Nambicon user interface allows to create, load, save and perform operations.

It contains:

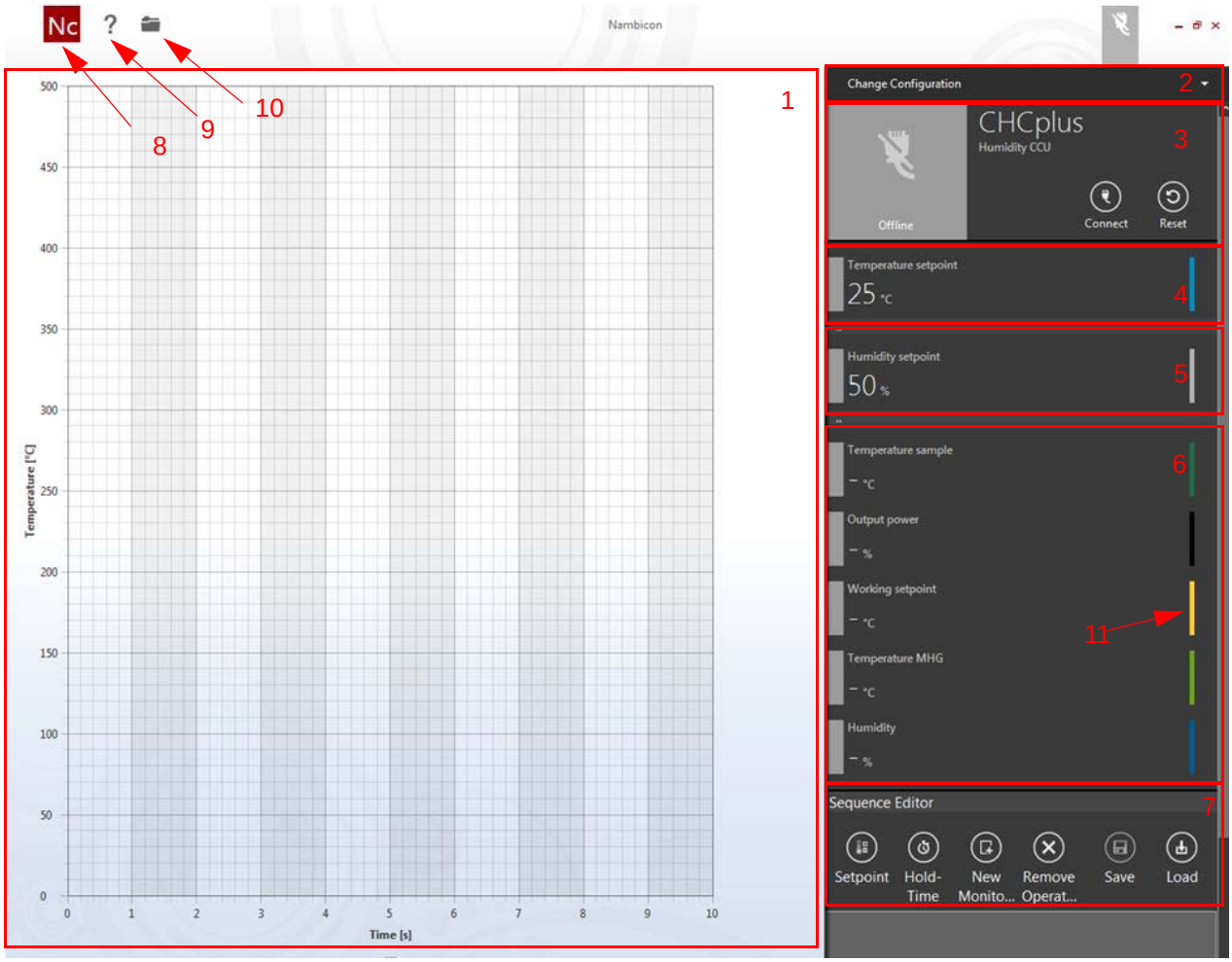

Fig. 2: Control Page

1 Graph
2 Configuration pane
3 Status pane
4 Setpoint temperature and value ranges
5 Setpoint humidity and value ranges (only valid for CHC plus⁺)
6 Sensor readout
7 Sequence editor
8 Settings
9 Open instruction manual
10 Open measurement file folder
11 Chart Color indication

6.1 Graph

6.1.1 Real-time Graph

The real-time graph contains the working setpoint preview as well as the measured and calculated parameters which are listed below the graph (1). The selectable parameters are:

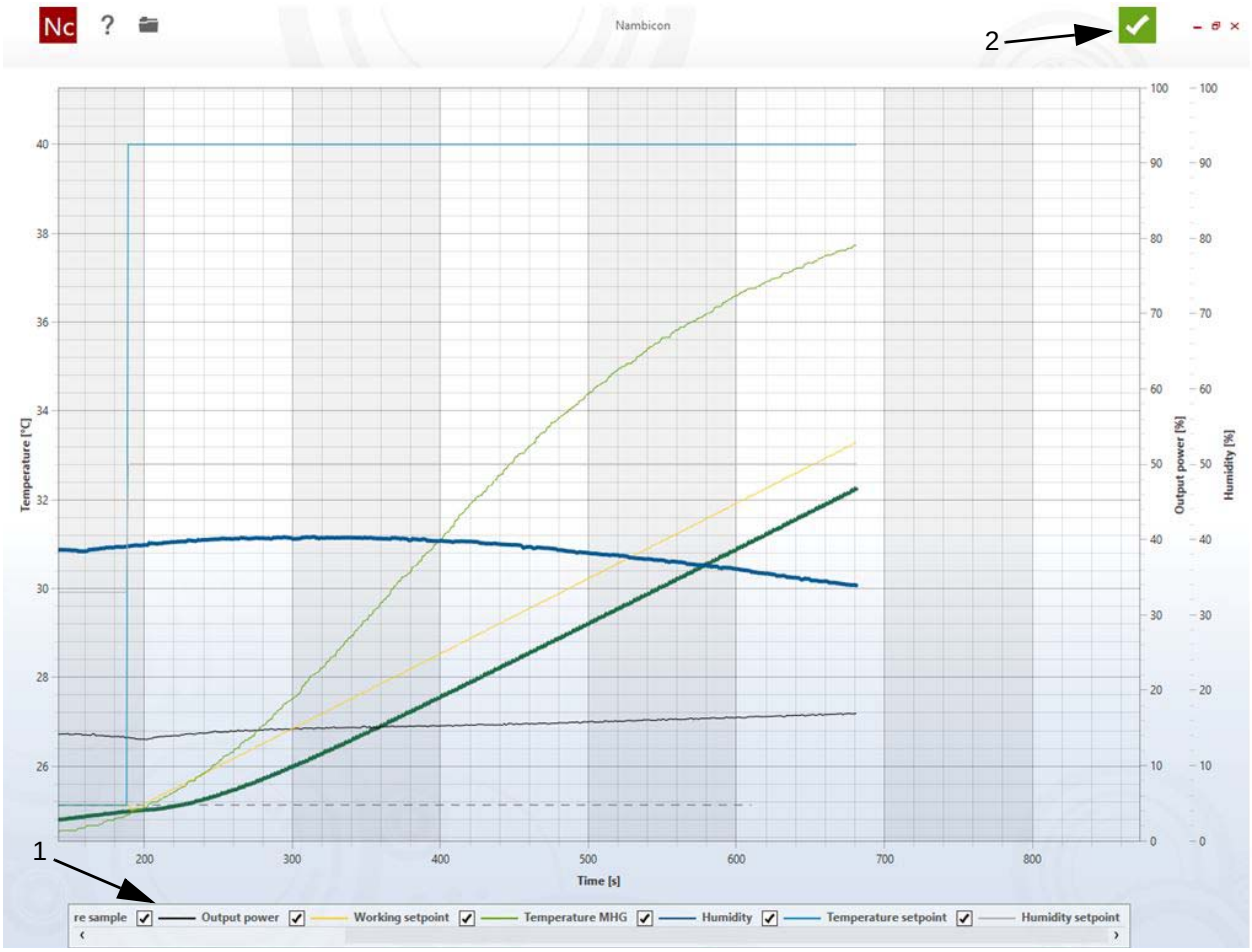

Fig. 3: Graph

Preview: Working Setpoint:	before starting the measurement the operation sequence can be shown in the graph [°C]
Temperature Sample:	actual temperature of the sample holder or sample plate [°C]
Temperature auxiliary[1]:	actual temperature measured with the thermocouple of the heater [°C]
Output power:	actual needed power [%]
Working setpoint:	calculated temperature for each time step [°C]
Temperature setpoint:	target temperature of the operation [°C]

The graph is updated once a second. The axes of the graph are:

x-axis	Time [s]
Left y-axis	Temperature [°C]
Right y-axis[2]	Output power (in % of maximum value) and humidity (in %rH)[3]

[1] *Please note that this value is not applicable for all instruments. Refer to the manual of your instruments for further information.*

[2] *not valid for BTS 150/500*

[3] *only for CHCplus+*

A double-click on the left mouse key will zoom out the graph to the minimum size of the profile. Selecting a detail of interest is done by holding the left mouse key and dragging the rectangular over the required area. Holding the right mouse key allows moving the graph in the position of interest. Scrolling with the mouse wheel will zoom or unzoom the graph.
To enlarge the graph click on the control pane select (2).

6.1.2 Offline Preview

To show an operation sequence without connection to the non-ambient attachment an offline preview can be created. After defining the parameters in the Sequence Editor select <Preview> (1) and the offline preview with a starting value of 25 °C is displayed.

The offline preview is not available for humidity modes.

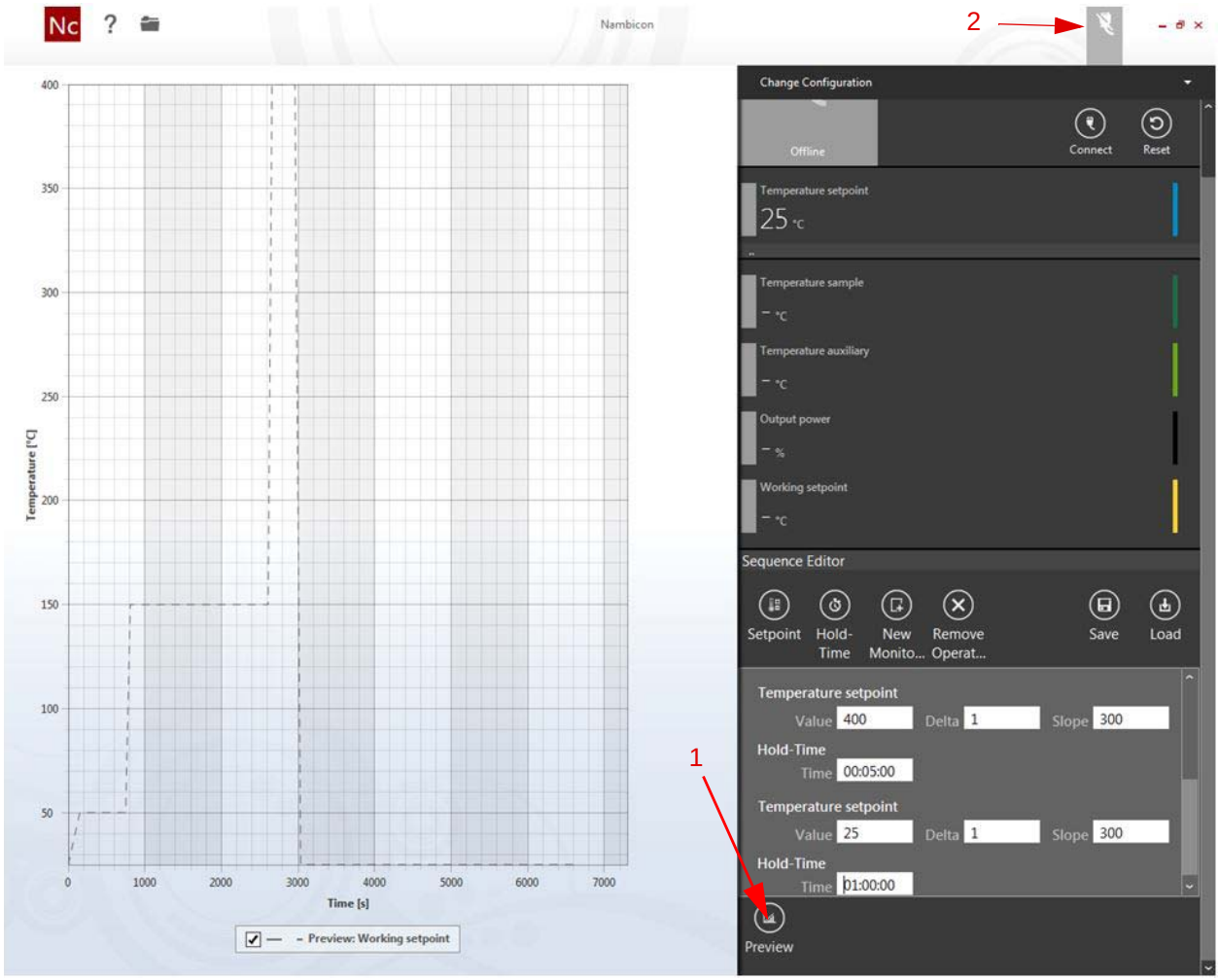

Fig. 4: Offline Preview

6.2 Configuration pane

The configuration pane allows selecting the desired configuration by expanding the pane using the arrow on the right side (1).

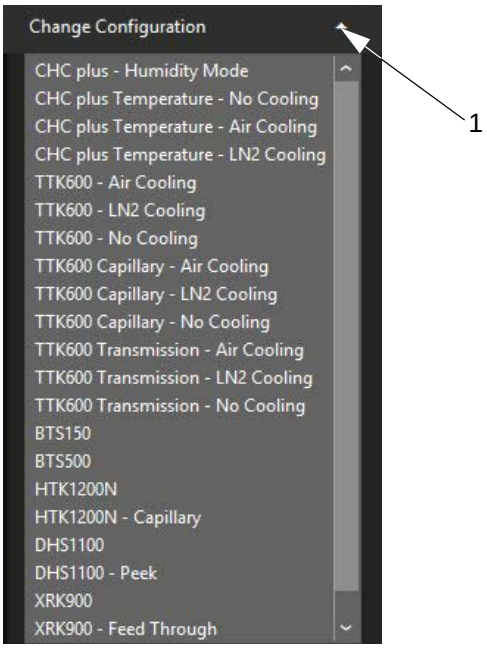

Fig. 5: Configuration pane

The selectable configurations are:

Configuration	Description (use)	Temperature limits	Humidity limits
CHC plus - Humidity Mode	Humidity mode	-5 to 150 °C	0 to 95 %
CHC plus Temperature - No Cooling	Temperature mode	+25 to 400 °C	---
CHC plus Temperature - Air Cooling	Temperature mode	-5 to 400 °C	---
CHC plus Temperature - LN2 Cooling	Temperature mode	-180 to 400 °C	---
TTK600 - Air Cooling	Standard sample holder	-20 to 600 °C	---
TTK600 - LN2 Cooling	Standard sample holder	-190 to 600 °C	---
TTK600 - No Cooling	Standard sample holder	+25 to 600 °C	---
TTK600 Capillary - Air Cooling	Capillary sample holder	-10 to 600 °C	---
TTK600 Capillary - LN2 Cooling	Capillary sample holder	-175 to 600 °C	---
TTK600 Capillary - No Cooling	Capillary sample holder	+25 to 600 °C	---
TTK600 Transmission - Air Cooling	Transmission sample holder	-20 to 600 °C	---
TTK600 Transmission - LN2 Cooling	Transmission sample holder	-190 to 600 °C	---
TTK600 Transmission - No Cooling	Transmission sample holder	+25 to 600 °C	---
BTS150	---	-20 to 150 °C	---
BTS500	---	+20 to 500 °C	---

Configuration	Description (use)	Temperature limits	Humidity limits
HTK 1200N	---	+25 to 1200 °C	---
HTK 1200N - Capillary	Capillary Sample Holder	+25 to 1000 °C	---
DHS1100	Graphite dome	+25 to 1100 °C	---
DHS1100 - PEEK	PEEK dome	+25 to 900 °C	---
XRK 900	---	+25 to 900 °C	---
XRK 900 - Feed Through	Electrical Feed-Through	+25 to 260 °C	---
DCS 500	Graphite dome	+25 to 500 °C	---
DCS 500 - PEEK	PEEK dome	+25 to 350 °C	---
DCS 500 - LN2 cooling	Graphite dome	-180 to 500 °C	---
DCS 500 - PEEK - LN2 cooling	PEEK dome	-180 to 350 °C	---
HTK 16N - Graphite	Graphite heating strip	+25 to 1500 °C	---
HTK 16N - Tantalum	Tantalum heating strip	+25 to 1500 °C	---
HTK 16N - Platinum 1 mm	Platinum heating strip 1 mm	+25 to 1600 °C	---
HTK 16N - Platinum 0.5 mm	Platinum heating strip 0.5 mm	+25 to 1600 °C	---
HTK 2000N - Tantalum	Tantalum heating strip	+25 to 1500 °C	---
HTK 2000N - Tungsten	Tungsten heating strip	+25 to 2300 °C	---
HTK 2000N - Platinum 1 mm	Platinum heating strip 1 mm	+25 to 1600 °C	---
HTK 2000N - Platinum 0.5 mm	Platinum heating strip 0.5 mm	+25 to 1600 °C	---

6.3 Status pane

After selecting the configuration Nambicon has to be connected to the control unit with <Connect>. In order for this to work, the selected configuration needs to match the used hardware configuration. A successful connection is indicated by changing the status from `Offline´ to `Standby´ or `Ready´. The following status messages can be shown:

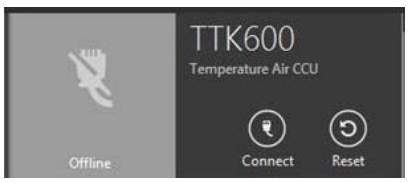

Fig. 6: Status pane

Offline:	Nambicon is not connected to the control unit (indicated by grey color).
Initializing:	Nambicon initializes; the connection (selected configuration; grey) is checked (Please note that this might take a few seconds).
Standby*:	Nambicon is connected to the control unit; the heater is switched off (indicated by orange color).

Ready:	Nambicon is connected to the control unit, the heater is switched on (not necessary when using a BTS) and the system is ready to send operations to the control unit (indicated by green color).
Processing:	A setpoint is actually triggered (indicated by green color).
Error:	An error occurred (for details see Error message and error message list; Chapter 7.2).

** not valid for BTS 150/500*

<Reset> can be used to control the control unit to 25 °C.

6.4 Temperature setpoint and value ranges

The setpoint and the value ranges are displayed in the temperature setpoint pane. The list of the values (dependent on the non-ambient attachment and used configuration) are shown by clicking on the points below setpoint display (1).

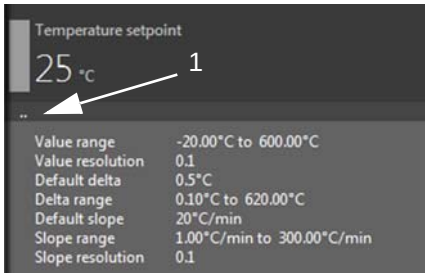

Fig. 7: Setpoint temperature and list of values

The default values are:

Value range:	min. and max. reachable setpoint
Value resolution:	quantization of setpoint value
Delta:	actual default delta; range of tolerance of the set point; after reaching the delta of the setpoint Nambicon proceeds with the next operation
Delta range:	min. and max. selectable delta
Slope:	actual default slope
Slope range:	min. and max. heating and cooling rate; nominal value depending on operating conditions
Slope resolution:	quantization of slope value

6.5 Sensor readout

The sensor readout shows the following values transmitted from the control unit depending on which configuration is used:

Fig. 8: Sensor readout

Temperature sample:	temperature of the sample holder or sample plate
Temperature auxiliary:	a second temperature readout; valid depending on the chamber
Output power:	output power [%]
Working setpoint:	calculated working setpoint [°C]
Humidity [1)]:	Humidity measured with the humidity sensor (displayed on MHG - Modular Humidity Generator)
Temperature MHG [1)]:	Temperature measured with the humidity sensor (displayed on MHG - Modular Humidity Generator)

1) only valid for CHC plus in humidity mode

(see also the manuals of the non-ambient attachment and control unit)

6.6 Sequence editor

The sequence editor helps to prepare a sequence of operations. A sequence may contain temperature setpoints <Temperature setpoint>, humidity setpoints (<Humidity setpoint>), hold times (<Hold Time>) and an operation that automatically starts a new monitor file <New Monitor File>. To remove one or several operations use the button <Remove operation> in the sequence editor or <Delete> on the keyboard.

Immediately after selecting a configuration Nambicon starts to log a monitor file in .csv-format. The monitor file contains a time log (once a second) and all sensor values, the actual status and the selected configuration. The button <Open measurement file folder> (refer to Fig. 2) directly leads to the folder in which the files are stored. A new monitor file can be created by inserting an appropriate operation. For doing this select <New Monitor File>.

An operation sequence can be saved as an xml-file (<Save>) and loaded again (<Load>). Just make sure, that the saved monitorfile is used with the same configuration that it was saved with. A working setpoints preview of the operation sequence is shown in the graph by activating <Preview>.

The sequence editor can be enlarged if necessary by drag and drop. The same procedure brings the editor back in its position.

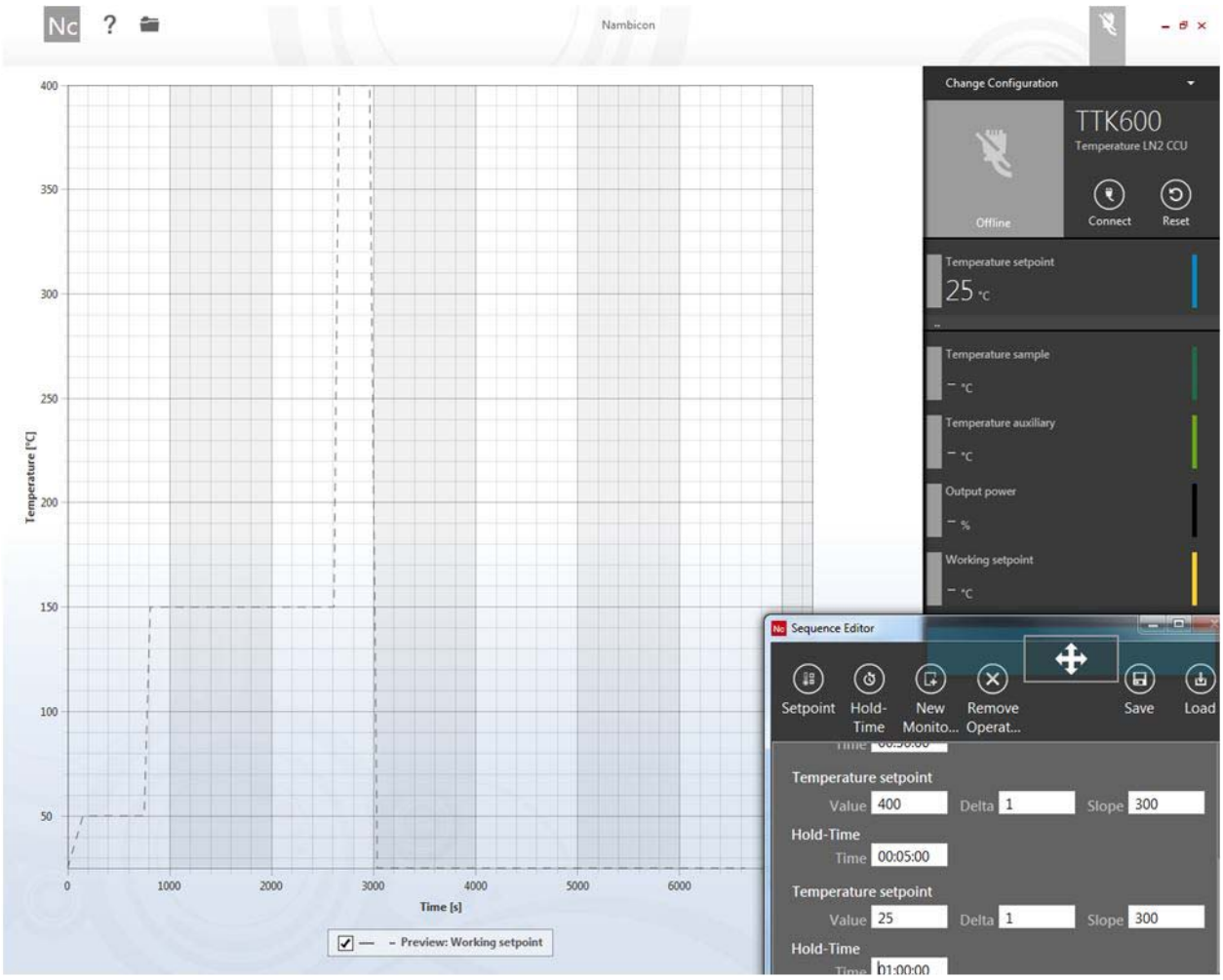

Fig. 9: Enlarging of Sequence Editor

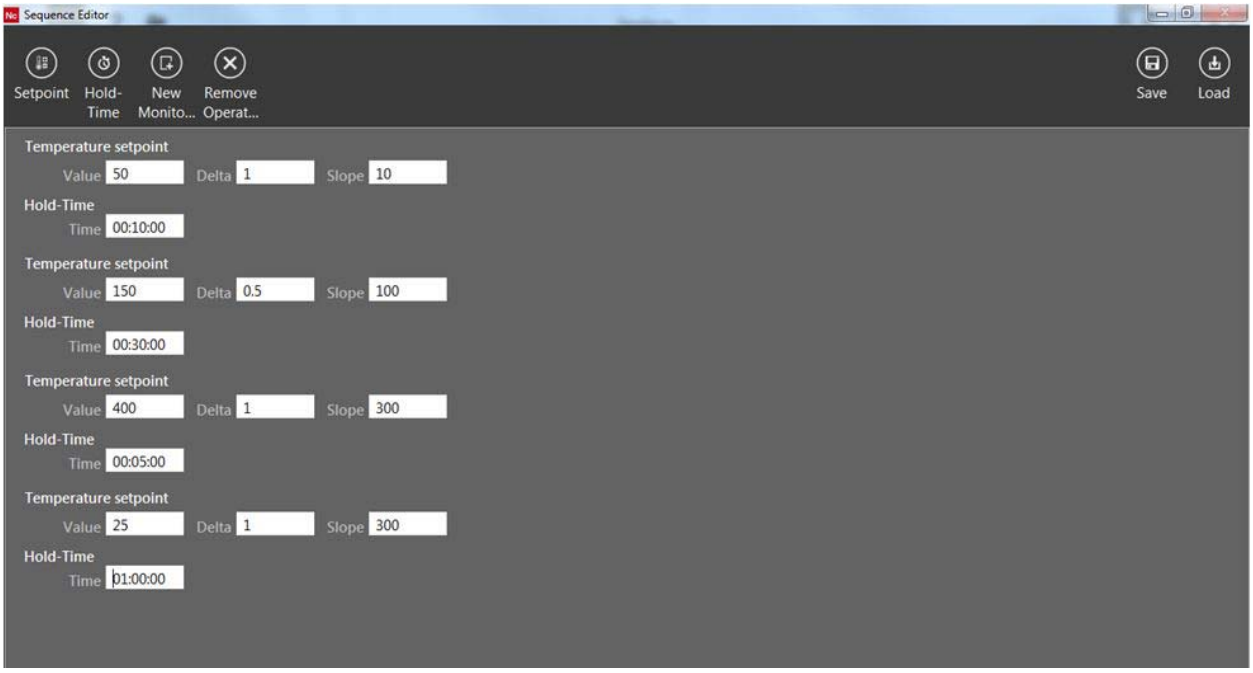

Fig. 10: Sequence editor

7 Operation

7.1 Using Nambicon as Control Software

Nambicon allows controlling the non-ambient attachment independently from the diffractometer software. With the sequence editor an indefinite number of operations can be put together depending on the experimental requirements.

An operation can contain just one setpoint or a sequence of setpoints, hold times and new monitor files. For each setpoint add delta and the slope which defines when a setpoint is reached and how fast it has to be reached respectively.

Tip: *The slope is just a nominal value and strongly depends on the experimental setup (i.e. the used atmosphere and the sample material).*

The slope of the humidity can not be changed. The software will automatically change to the value `1´ *after clicking <Start>.*

After the compilation of the sequence the first operation starts by activating <Start>.

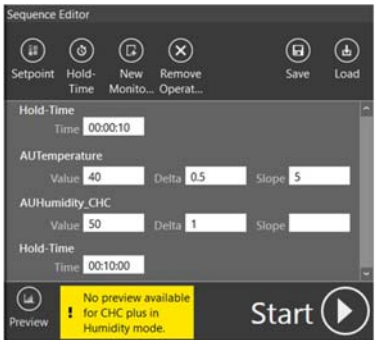

Fig. 11: Sequence editor

In case a setpoint is actuated, the status pane shows the status `Processing´. During a hold time the status `Ready´ is visible. The actual active operation is also signalized with progress indications. The progress of the sequence is shown by a red bar (1) on the bottom of the sequence editor.

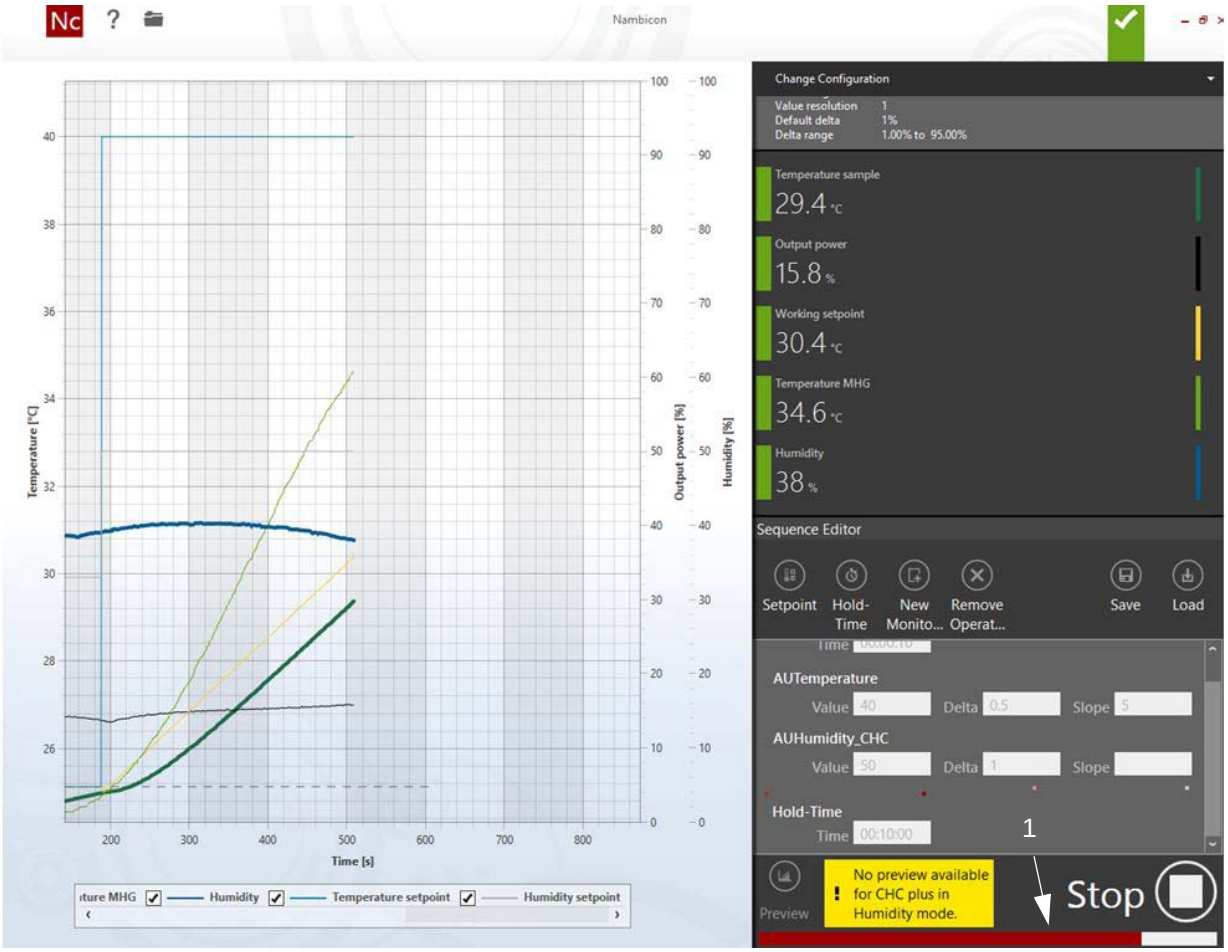

Fig. 12: Progress of the sequence

An operation can be stopped at any time by using <Stop>. The actual monitor file however will only stop in case the configuration is changed or Nambicon is closed.

7.2 Error

If an error occurs at any time during operation of the control unit, the control unit will interrupt the heater (this means control to the default setpoint) and an appropriate message will be sent to the software. The status of Nambicon will be set to `Error´ which is indicated by red color. At the time the error is removed and the control unit switches to the appropriate mode, this is also indicated in Nambicon by the status `Ready´ or `Standby´.

The operation sequence, however, is terminated due to the error case and has to be started again.

The valid error codes for each attachment can be found in the instruction manuals of the attachments.

The following list summarizes all possible error messages which can be displayed in Nambicon:

Error	Description
The target temperature (set point) is not reached within a specific period of time.	The electronic circuit of the heater is interrupted.
The sensor ‘{0}’ operation failed. (where ‘{0}’ is the sensor)	The electronic circuit of the temperature sensor is interrupted.
No water flow detected.	There is no or too little water flow.
The sample stage housing is overheated.	The protective thermoswitch in the sample stage housing is activated.
The chamber is not closed.	The contact switch does not detect the lid of the instrument.
No air cooling detected.	The pressure of the cooling air is too low.
Low water level or missing water tank in the MHG control unit.	The water level in the tank of the MHG is low or the tank is missing.
Failure of a pump in the MHG control unit.	The pumps of the MHG are leaking and water is detected inside the MHG enclosure.
Error (code = {0}) occured on Julabo Circulator HE. (where ‘{0}’ is Julabos error code)	The Julabo circulator shows an error. The error codes are given in the Julabo manual.
Current cables disconnected	The microswitch does not detect the current cables.

8 Firmware Update

(only applies for non-ambient attachments running with a CCU control unit)

In case a firmware update is required (e.g. changes in the system settings, implementation of a second or third power module), this can be done via the mini-USB connector on the front side of the control unit. The files for the firmware update are sent upon requirement directly from Anton Paar GmbH or via the local representative of your diffractometer manufacturer. For performing a firmware update, proceed as follows:

1. Switch to the Settings page by Clicking on <Nc> (1)

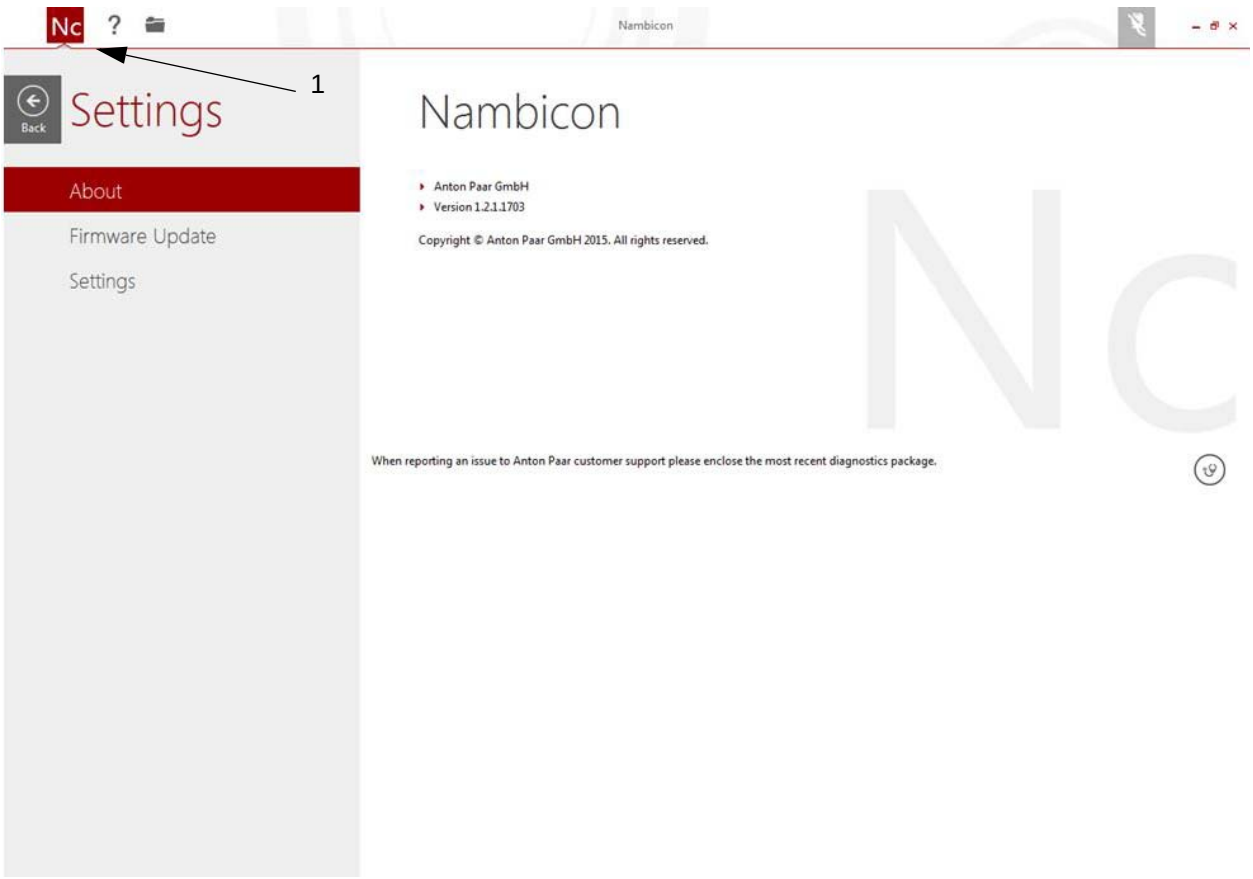

Fig. 13: Settings page

<About> shows the most recent version of Nambicon.

2. Switch to <Firmware Update>

In case no CCU is connected:

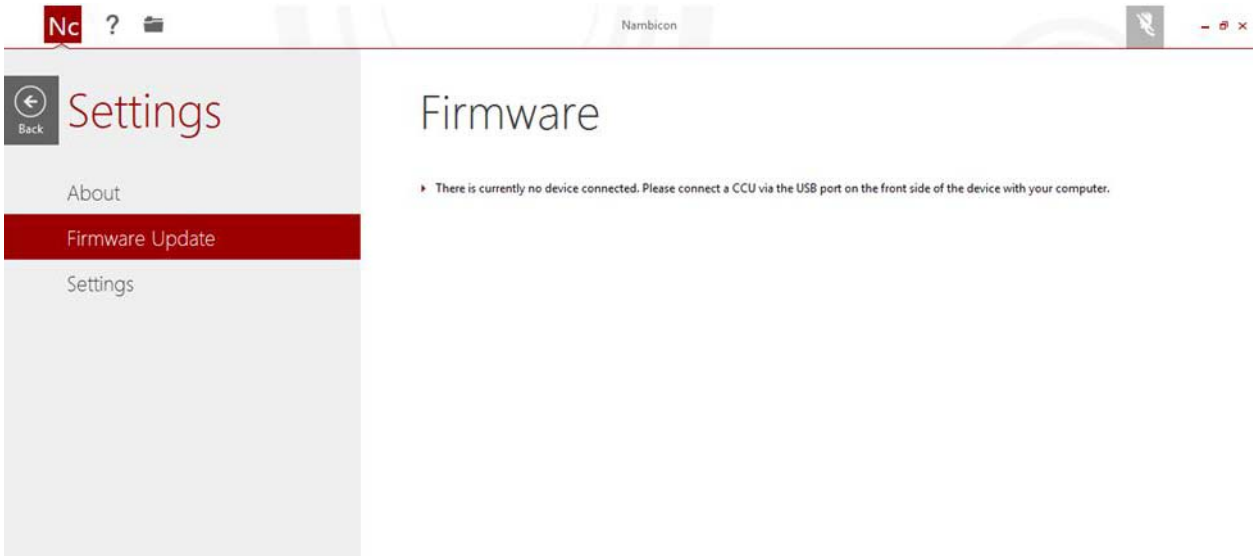

Fig. 14: No connection detected

In case a CCU is connected you can find a list with connected modules, their hard- and firmware versions as well as the state.

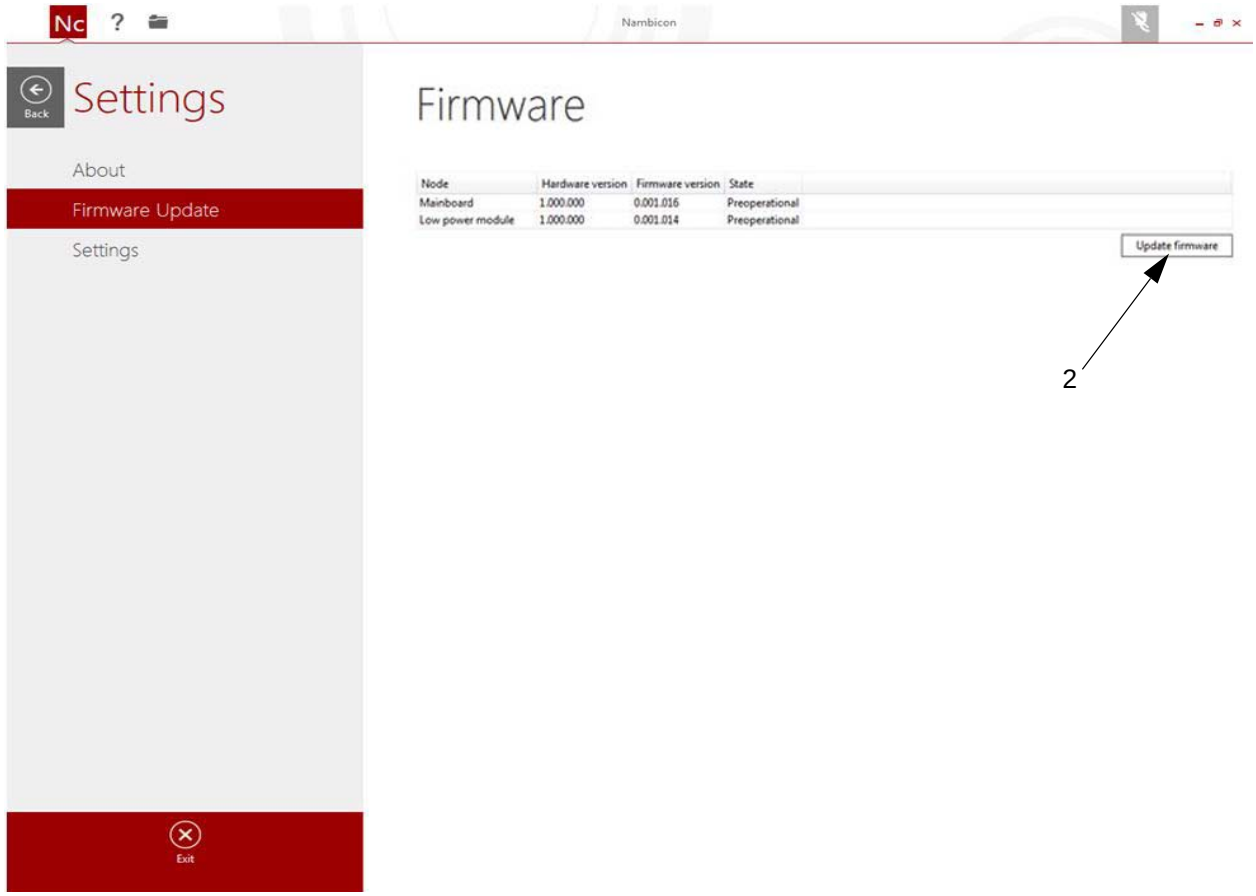

Fig. 15: Installed Firmware versions

3. Click on <Update firmware> (2)

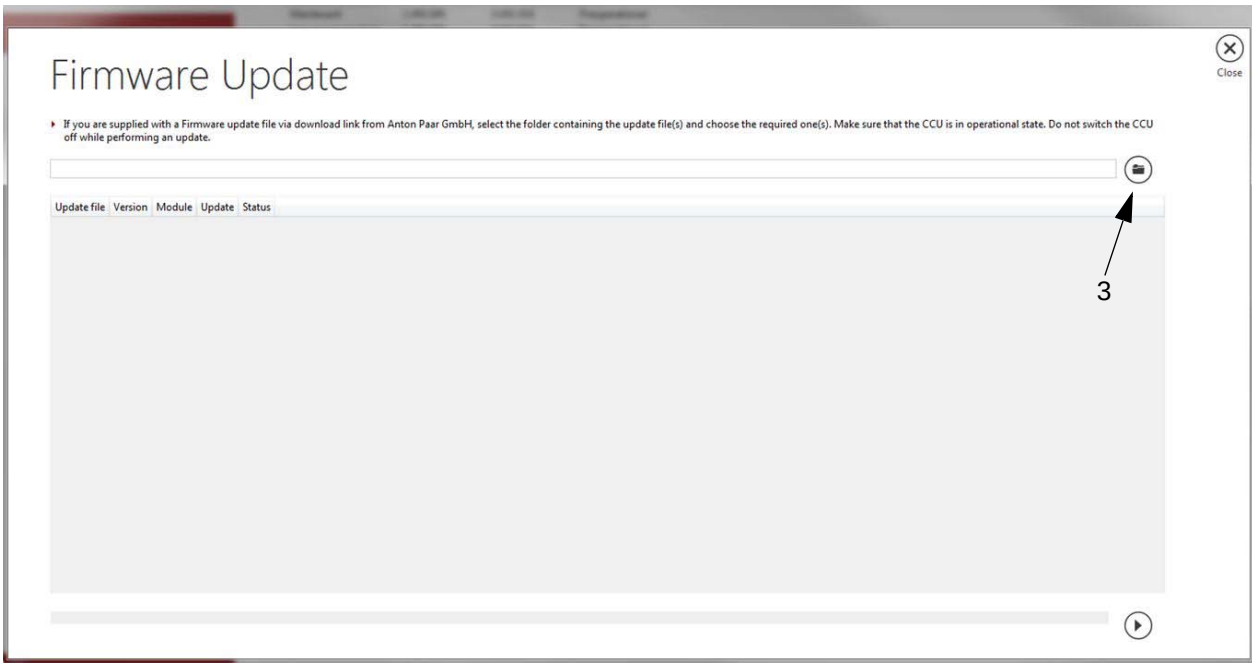

Fig. 16: Firmware Update

4. Open the folder (click on <Open folder>) which contains the update-files (3)

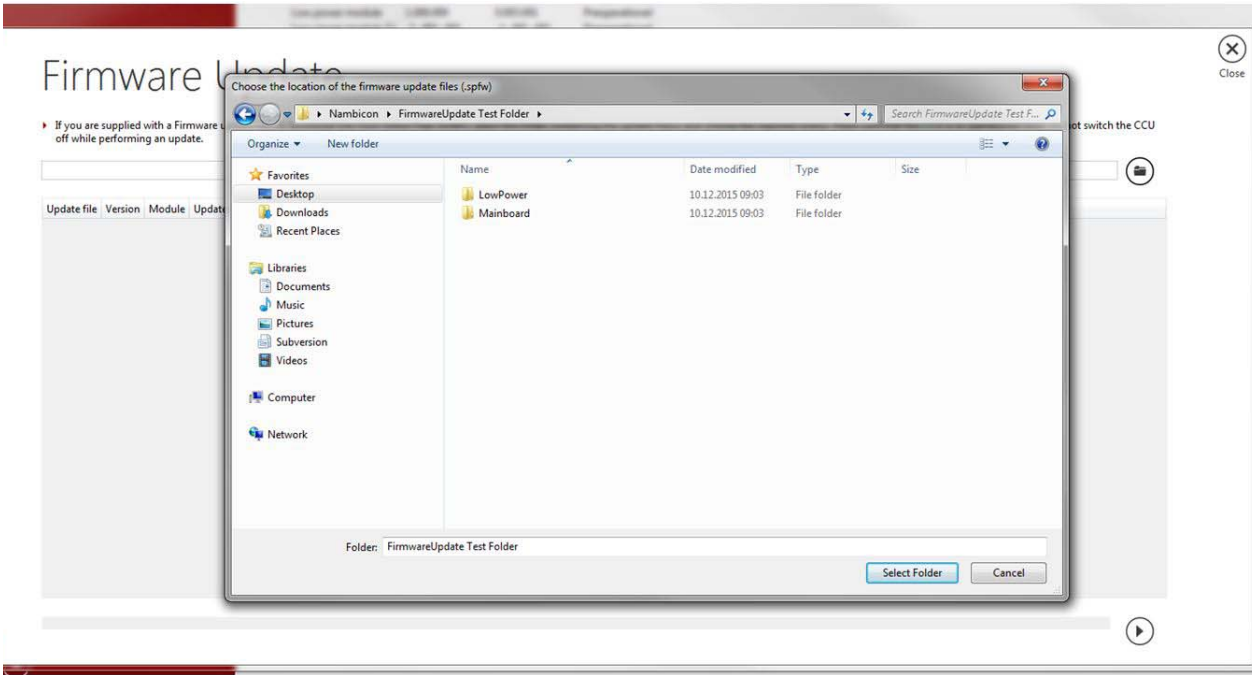

Fig. 17: Firmware Update - select folder

5. Select the required folders (<Select folder>)

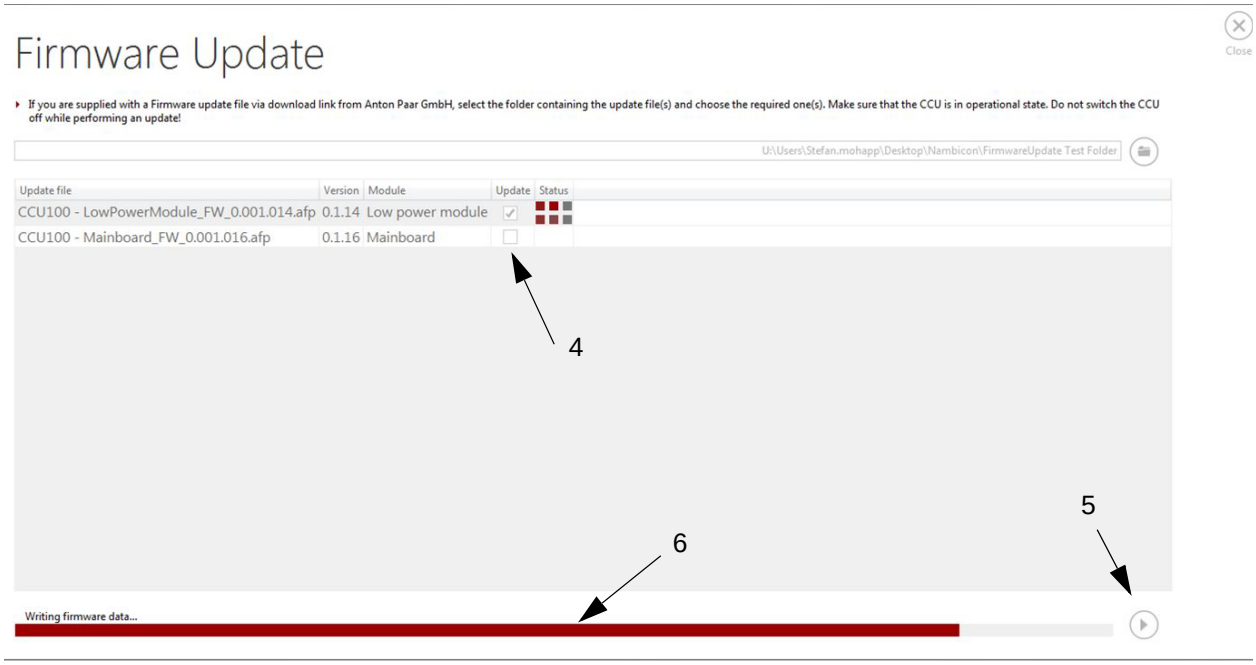

Fig. 18: Firmware Update - select module

6. Select the modules on which you would like to perform an update (4). When the mainboard is selected together with a further update file, the mainboard is always updated first.
7. Start the update procedure with <Start the selected firmware> (5). The progress of the update is indicated by the progress bar (6) on the bottom of the window.

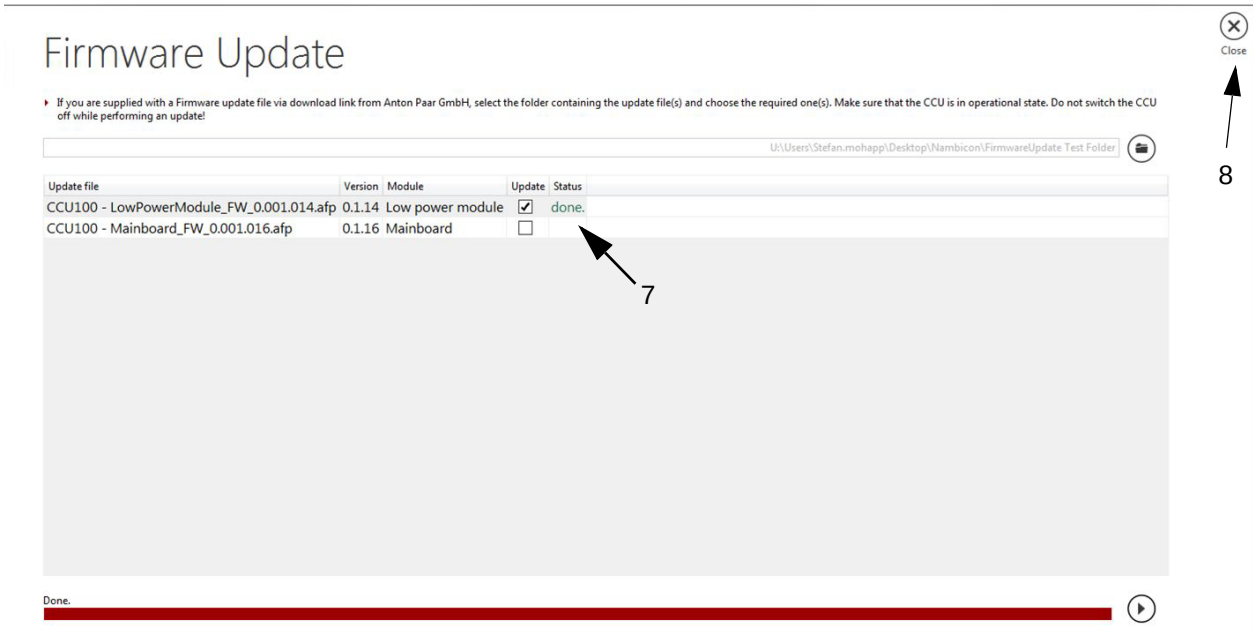

Fig. 19: Firmware update finished

8. After the update finished and the status changed to `Done´ (7), close the window (8)
9. The modules are now listed in the settings page with the updated versions.

9 Settings

The Nambicon settings page allows to select the device configurations which are shown in the configuration pane, to adapt USB communication settings and to reset Nambicon settings.

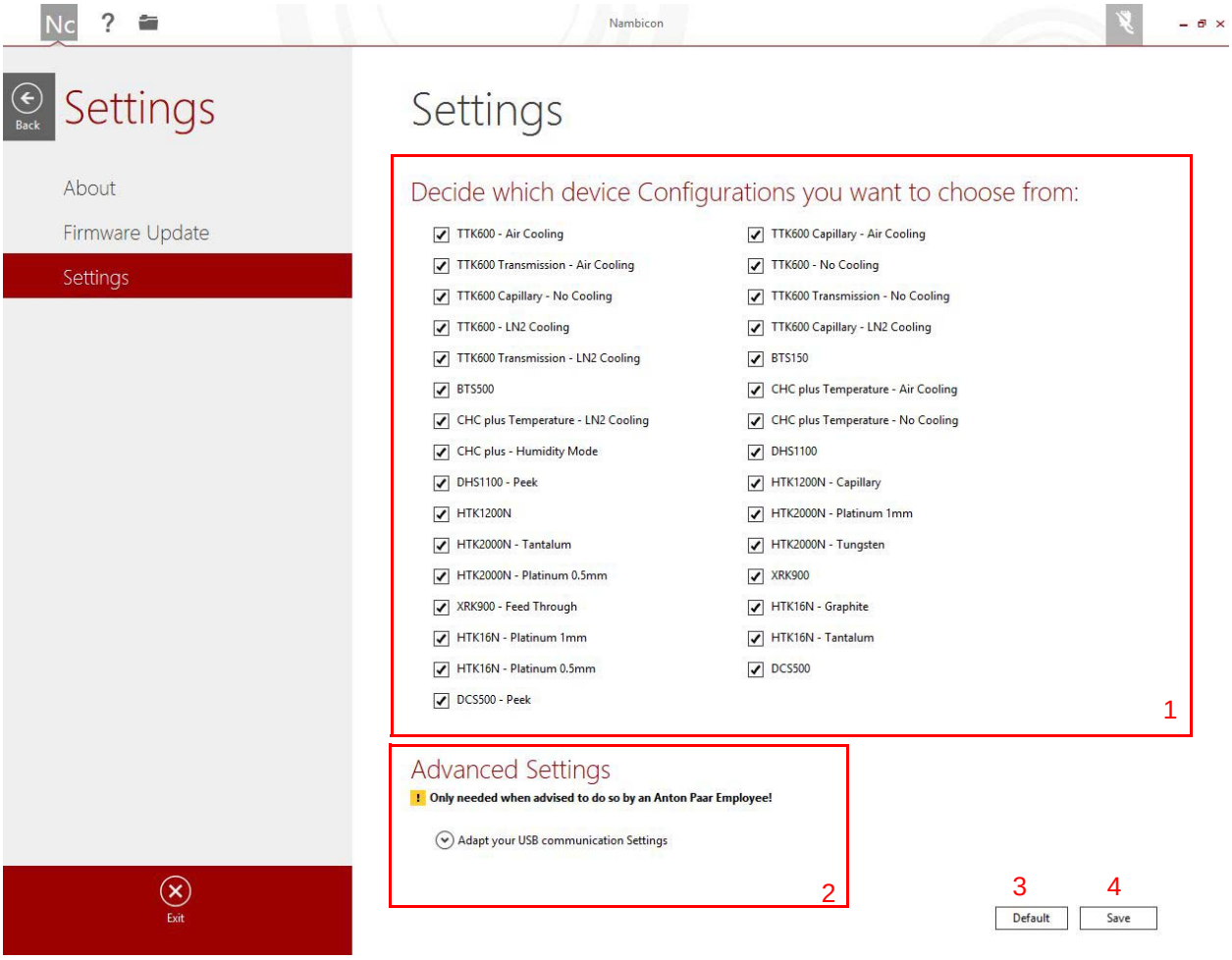

Fig. 20: Settings

- **Available Configurations (1)**: To reduce the list in the configuration pane (Fig. 2 - 2), select required configurations.
- **Advanced Settings (2)**: Only needed when advised by an Anton Paar employee.
- **Default (3)**: To reset to the default settings.
- **Save (4):** To save changes. After clicking on <Save> a message appears to restart Nambicon for an activation of the changes.

10 Creating a diagnostic package

A diagnostic package may be automatically generated if an unknown error occurs or Nambicon crashes. This package can be sent to Anton Paar GmbH. With the included files an evaluation of the problem may be facilitated.

For creating a diagnostic package proceed as follows:

1. Switch to the Settings page by Clicking on <Nc> (1)

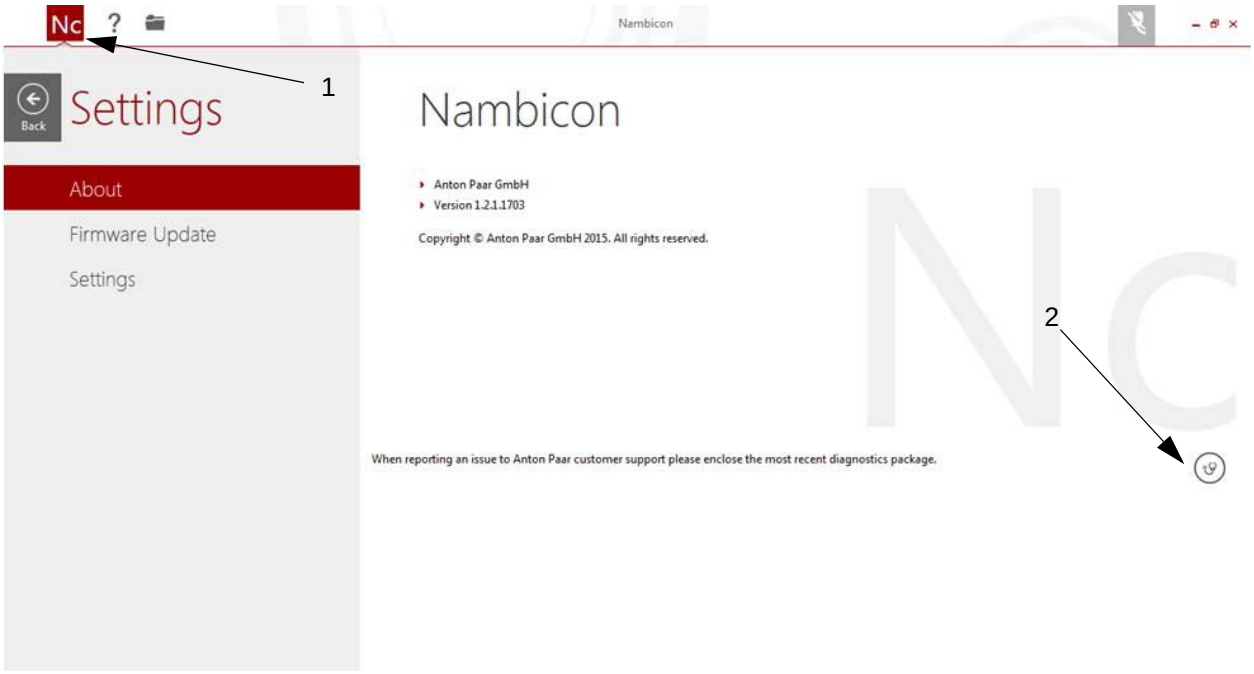

Fig. 21: Settings page

2. Click on the <Generate a diagnostic package> (2)

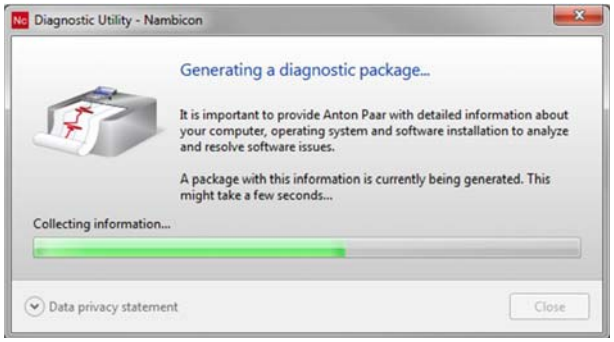

Fig. 22: Diagnostic Utility

3. The progress is indicated by the progress bar. Save the package in the desired folder after the generating process is finished.
4. Upon request send the folder to Anton Paar GmbH.

Appendix A: End User License Agreement

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V1.0 – *July 1, 2014*

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