novasina
The Art of Precision Measurement

Operating Instructions LabMaster-aw neo

Doc-No: 005739.05

Novasina versions: V1.11 and higher

Inhalt

1. Introduction

1.1 You are awesome!

Thank you for having purchased a Novasina LabMaster-aw neo water activity meter. You have opted-in for cutting-edge functionality paired with very precise, accurate and reliable sensor technology made in Switzerland. A fantastic symbiosys! This top of the line instrument allows you to make and get most out of a water activity measurement but ensure safe, reliable operation and full 21CFR11 compatability, where this standard is applicable for such a benchtop meter. Please read these operating instructions carefully before setting the unit into operation and contact us if you feel unsure about a certain task or procedure. We are here to help you. Your local representative is listed on our website www.novasina.com

1.2 Intended Use

The Novasina LabMaster-aw neo is exclusively intended for measuring WATER ACTIVITY under strict adherence to the information and notes given in this manual. Any use beyond this scope is considered to be a violation of the intended purpose and may endanger your safety or could result in the product being damaged. Any use of this Novasina instrument other than specified is at customer's own risk. By any means will the manufacturer or supplier be liable for any resulting damage.

Safety Instructions

- The Novasina LabMaster-aw neo should be serviced, maintained
- A LabMaster-aw neo must not be used in explosive or hazardous zones. It is designed to be operated in laboratory environments.
- Do not measure explosive or highly flammable materials/samples with the LabMaster-aw neo.
- Before connecting the unit to power, ensure that mains voltage complies with rated voltage and frequency of Novasina LabMaster-aw neo (check label on the back) which is 100...240V AC / 50..60 Hz. Verify as well that plug and cables do not have any visible damage.
- Das LabMaster-aw neo system may be used only under the specified operating conditions (see Spec Sheet, downloadable on our website)
- Please consider and respect local regulation in terms of the usage ond operation of electronic measurement instruments.
- Please use original accessories and spare parts from your local representative only. Those parts are listed on our website, www.novasina.com.
- Without written permission of the manufacturer, it is forbidden to perform any technical change (mechanical, electronical, hardware and software) at this aw-meter.
- Power must be disconnected before the housing of LabMaster-aw neo is opened (disconnect power plug completely)
- The workplace must be set-up according current ESD regulations and a service technician must use and wear all necessary ESD implements. Otherwise, defects on components cannot be excluded.
- Unanthorized opening of the LabMaster-aw neo will lead to immediate loss of warranty

1.3 Protective Measures

Please take note and respect protective measures to avoid instrument problems due to improper handling. Warranty is gone in that case.

1.3.1 Power On / Power Off

- Remove power plug only if instrument has shut-down COMPLETELY! Data or essential system files can be destroyed otherwise.
- Switch off instrument only, if sample has been removed from the measurement chamber. Alternatively it can lead to sensor failure due to condensation.

1.3.2 SD-Card

- Do not remove SD-Card during reading and writing procedures. Otherwise, data can be destroyed or driver files can be blocked.
- If the instrument refuses access to the SD-Card, reboot this water activity meter. It happens if SC-Card is defective or if previous point has not been respected.

1.3.3 Chemical Protection Filter

Each LabMaster-aw neo is equipped with a mechanical protection filter which helps avoiding direct contact of the sensor with the sample once sample cup is overfilled. However, some samples contain volatiles like glycerin, polyethylenglycol (PEG), alcohol, organic acids like acetic acid, strong aroma and/or essential oils. All those volatiles affect a water activity measurement if any preventive measures are in place and can lead to sensor destruction in a very short time. Novasina offers a pragmatic solution by installing chemical protection filters. Those filters contain specially prepared material which absorb the dangerous volatiles BUT let water vapor passing through. This allows a user to get the real water activity value of his sample without the influence of volatile compounds.

Eventhough it is best to monitor filter saturation by changes in verification/ calibration intervals, you can apply the following rule if sample is not loaded by volatiles dramatically:

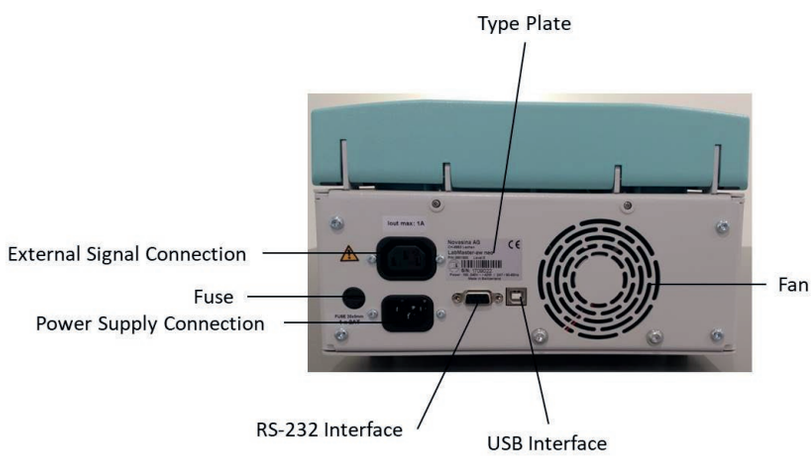
- Measure up to 5 samples a week, change filter half-yearly to yearly
- Measure more than 5 samples a week, change filter quarterly to half-yearly

A respective filter selection data sheet which guides you through filter selection can be downloaded on our website www.novasina.com

Contact our local representative, if you have any doubts about which filter is the most appropriate one or if you feel unsure about the exchange intervall.

2. LabMaster-aw neo

2.1 Instrument overview



2.2 Scope of Supply

The LabMaster-aw neo is available in one version containing all feauters and connectivity interfaces. No upgrades or license purchases needed
If you open the box, you should find:

- 1x LabMaster-aw neo
- 1x Carton box with:
  - 2x ePW dispenser with 20 sample cups each plus a dispenser support
  - 1x Grey case with:
    - 6x SAL-T (11/33/58/75/84/97%rH)
    - 1x SAL-T 100 (empty)
    - 1x Allen key
    - 1x Service Tool LabMaster-aw neo
- 1x power cord
- 1x Quick Guide
- 1x Factory certificate
- Make sure you have a commercially available USB 2.0 or RS232 cable available
- The current manual can be downloaded at any time from www.novasina.ch

2.3 Optional Accessories

Aside of the chemical protection filter, Novasina offers a variety of optional accessories. This contains additional SAL-T standards, ranging from 4%rH (0.04aw) up to 97% (0.97aw).

Another requested accessory is the SI-Set. To get further product insights, especially detailed information about the kinetics of the water and the inner structural changes, sorption isotherms are a good tool to support those investigations.

To get a first impression about the shape of such an isotherm, the Novasina SI-Set in conjunction with the SAL-T humidity standards do the job. Please note that it is not possible to generate the same resolution and extent with this method like in case of using a DVS Isotherm but it costs also just a fraction of such kind of machines.

2.4 Get it started!

You have unpacked the new LabMaster-aw neo with pleasant anticipation, now we instruct you how you can get a perfect start working with the new aw-meter. Got lost somewhere? No worries, there is a Help System on the instrument. Simply press the yellow button with the question mark and get info about the programming opportunities in that specific menu.

2.4.1 Switching On and Off

Switch on the instrument by pushing the small black button you can find in the right lower front-side corner. The system is booting for approx. 45sec. Once completed, the measurement screen is displayed.

Press the same black button if you want to switch off a LabMaster-aw neo

Important:

Always shut-down instrument COMPLETELY before you remove power plug. Data or essential system files can be destroyed otherwise.

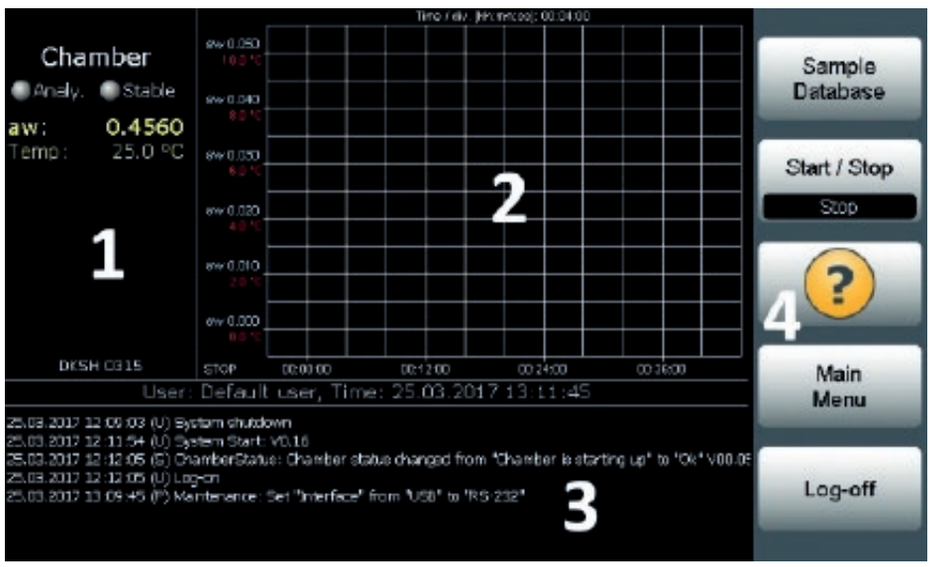
2.4.2 Preparing the instrument for normal operation

- Programm correct date and time (in menu „system settings“)
- Perform a verification or calibration, if the instrument has not been used for a longer time. If it is brand-new, no verification or calibration is needed to start working with the LabMaster-aw neo.

3. Screens and Menu

3.1 Measurement Screen

Once boot process is completed, main screen appears. It contains the following areas:



1. Chamber Area
2. Stable Display or Graph Area
3. Audit Trail Area
4. Function Key Area

3.1.1 Chamber Area

All necessary infromation about a measurement is displayed here. This includes:

- Status LED:
  - Analy.: LED flashing in yellow color, if measurement is running.
  - Stable: LED turns green, if measurement is finished.
- Current Measurement Info (yellow color): Water Activity value, temperature, measurement time plus sample ID of an ongoing measurement.
- Stable indicator (progress bar): Indicating progress of measurement. The greener the bar, the closer to completion. Stable mode is displayed underneath of the bar.
- Method Name: If a method is loaded from sample database, method name is displayed at the bottom of chamber area window.

3.1.2 Stable splay or Graph Area

Depending on settings, stable measurement information or graph visualization is displayed in this area. To change from one to the other, press „Main Menu“ button in the function key area, then press on the icon „Display“ and change settings according to your needs.

Stable Display Area

Once a measurement has been finished, the stable information is displayed in this area, clearly visible from distance with the following information:

- Stable: Indicates, that measurement is completed.
- aw: Measured Water Activity value.
- Temp: Measurement temperature.
- Time: Measurement time in hours, minutes and seconds.

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To see a graph vizualization of the measurement, press on the Stable Display Area.

Graph Area
To activate the graph function, make sure that „Graph“ is selected in „Display“ menu on the main screen. Individual graph settings can be made in „Graph Parameters“ menu which is located in Main Menu -> Chamber Settings.
To analyze a graph in more details or full-screen mode, simply press on the graph area
The following parameters are available as a graph:

- Y-Axis
  - Blue color: Water Activity (or %rH, depends on Settings).
  - Red color: Temperature.
- X-Axis
  - Measurement time: Measurement time in minutes, intervall can be set in „Graph Parameters“ in „Chamber Settings“ menu. The current intervall is displayed just above the graph.

3.1.3 Audit Trail Area
The last few events of the day are displayed in this area. Press on the audit trail area to see the complete audit trail and to be able to filter certain events, including last masurement results.
Every entry consist of the follwing data:
- Date and time: Time Stamp when the event was logged.
- Indicating Event letter in bracket:
  (U): User Events.
  (P): Parameter Changes.
  (E): Errors.
  (S): System Events.
  (R): Measure Results.
- Log Description: Short info and description about the event.

3.1.4 Function Key Area
In this area, the following main control buttons are accessible:
- Sample Database: Load a specific method from sample database or administrate it.
- Start/Stop: Start or Stop a measurement. The actual status is displayed in the button itself.
- Help: The button with the question mark is the entry to this help menu.
- Main Menu: Access to main menu with all the „chamber setting“ and „system setting“ options.
- Log-off: Log-off current user / lock instrument. A new log-in might require a user password, if one has been programmed.

3.1.5 Warning or Information Symbols

Once there is an issue which needs special attention, an information is displayed in the chamber area, replacing the display of the current measurement values.

Symbol	Description	Note
	An error with the current measurement chamber has been noticed	Press icon the get more details
	Sensor will be brought to operation temperature	Press icon the get more details. However, a measurement can be started but data will only be displayed, if this symbol has disappeared
	Due to an on-going incident, measurement values cannot be gathered Example: dew protection is activated	Press icon the get more details
	Due to a warm sample or warm SAL-T, there is a risk of condensation of water on the sensor	Remove sample/standard from measurement chamber as soon as possible. Let it cool down outside of the chamber. Do not forget to cover sample cup or SAL-T to avoid humidity exchange with air humidity from ambient air

3.1.6 Status Bar

The following information is displayed alternating:

Text / Symbol	Description	Note
User: ..., Time: ...	Current date and time	
Press icon (chamber section) for more information	Press on the displayed icon in chamber area to get additional info	
Press icon (chamber section) to abort beep!	Press on the displayed icon in chamber area to switch of the „beep“	Press icon the get more details
Calibration validity expired	Sensor should be calibrated	This function needs to be activated. Will be displayed in light red color
Filter exchange required	Chemical protection filter must be replaced	This function needs to be activated. Will be displayed in light red color
Stable signal reminder activated!	Stable signal reminder has been activated	
Sensor nearly exhausted!	Sensor is in bad condition and cannot be calibrated anymore soon	Contact your local representative to order a spare sensor to avoid instrument downtime due to defective sensor

3.2 Main Menu Screen

The main menu screen offers easy access to all funtions which are necessary to programm the LabMaster-aw neo according to user‘s or company‘s needs.

Note:
Individual menu and functions can be locked by an active user management. If you need certain functions for your work routine, please contact the administrator of this LabMaster-aw neo.

The main screen offers the following icons and functions:

Element	Description	Note
	Protocol will be printed. Switch back to measurement screen after printing	If measurement is currently runing, actual protocol is printed. If stable, stable protocol is printed
	You can select here if you want to see a graphical visualization or a stable values in the stable display or graph area	
	Press on this icon to go back to measurement screen	This button is also available in submenus
	Accessing system settings to adjust system parameters	System parameters are like date/time/units/user management etc
	Accessing chamber settings to adjust chamber parameters	Chamber settings are like measurement temperature, stability modes etc.

3.3 Navigation Buttons

While programming settings in submenus, navigation buttons are displayed to ease browsing through all available options.

Button	Description	Note
	Close the current submenu and dispalys the parent menu	
	All menus are closed, switch back to measurement screen	This button is also available on main screen
	Scroll one page upwards	Only availabe if further menu items are above the current visible window
	Scroll one page downwards	Only availabe if further menu items are below the current visible window

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3.4 Menu „Chamber Settings“

All relevant programming and settings for the measurement chamber can be done in this section.

Menu Point	Description	Note	Factory Settings
Temperature Control	Adjustment of temperature control	See chapter 4.1	25.0°C
Stable Mode	Stability system Mode	See chapter 4.2	ISO 18787
Stability Observation Time	Stability observation time for modes „Manual“ and „Query“	See chapter 4.2. This menu item is only displayed, if stable mode is set to „Manual“ or „Query“	5 min.
Stability Check Temperature	Observance of target temperature for temperatur stability	See chapter 4.2.5. This menu item is only displayed if „Temperature control“ is on and Stable Mode is NOT set to „Quick“	Off
Graph Parameters	Settings for graph visualization on measurement screen	See chapter 7.2	
Data Logger	Menu item for logging functions	See chapter 8	Sample Number:0000 Interval recording: 10 sec
Sensor Calibration	All necessary functions to display cal points or set verification tolerance	See chapter 6	
Chamber Info	The following info is displayed: **CHAMBER** - Instrument name - Serial number chamber - Firmware version chamber and IR-sensor **SENSOR** - Version of sensor - Serial number of sensor - Firmware info - Last calibration info **PROTECTION FILTER** - Last registered exchange of chemical protection filter		

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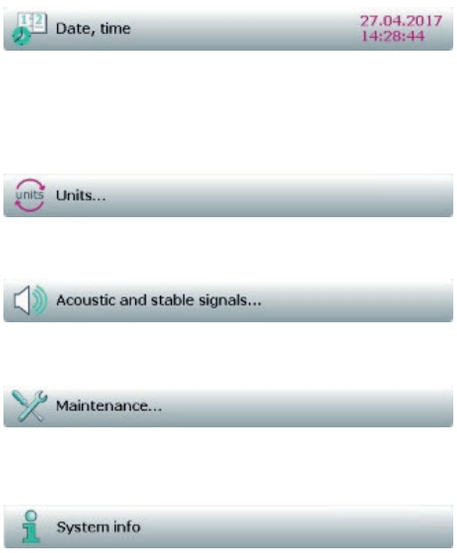
3.5 Menu „System Settings“

All relevant programming and settings for the system itself can be done in this section.



Menu Point	Description	Note	Factory Settings
Date, Time	Setting of date and time	It is inevitable that date and time is set correctly. Otherwise functions like audit trail, management of calibration points as well as various log- and protocol functions will be skemed or not working properly	
Units	Submenu for setting the measurement unit and date format		aw, °C, DD.MM.YYYY
Acoustic and stable signals	Adjustment of acoustic and stable signals	See chapter 12.1.	
Maintenance	Submenu for maintenance of LabMaster-aw neo	See chapter 13.	
System info	Info about instrument, master firmware and type of license		

4. Important Pre-Settings

4.1 Temperature Control

4.1.1 Adjustment of Temperature

External regulations (ISO, AOAC etc) or internal guidelines request a water activity measurement at a specific temperature (i.e. 25°C). The LabMaster-aw neo allows a measurement temperature setting between 0°C (32°F) and 60°C (140°F). To set or change a temperature value, go to Chamber Settings -> Temperature control and enter the requested temperature in the pop-up keypad.
Deleting the current temperature value sets temperature control to „OFF“

Note: If target temperature has not been reached, a „stability check temperature“ is activated, stability can not be reached , thus measurement is delayed. A Retarded (temp) message appears below the stable indicator bar in that case.

Important!
To avoid condensation of water, place sample in measurement chamber only after target measurement temperature has been reached.

Hints:

- Ideally, measurement temperature should not be lower than sample temperature. By this, condensation can be excluded.
- If stable parameters are set correctly, a short time condensation (humid sample, max. 4°C over measurement temperature) can occur and is not an issue.

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4.1.2 Functionality of Temperature Control

- Sample surface temperature is the one which is regognized and control is set to. Controller is optimizing itself to current operation and environmental temperatures.
- Sample surface temperature is kept constant to target value +/-0.02°C.
- If instrument is operated in completely new conditions or target value is changed remarkably, it can take up to 30mins until target value +/-0.30C is reached. It is not an error of the instrument, it is more an indication that optimization is in progress
- Once optimization of control has been finished, the parameters are stored once instrument is shut-down or temperature control is set to „OFF“

4.2 Novasina Stable System

There are tons of literature about it, you can love it or hate it but it is proven by physics and chemistry that a reliable, precise and accurate water activity measurement requires an established humidity equilibrium between the free, available water in the sample and the humidity of the air which is located above the sample surface. A perfectly established humidity equilibrium requests endless time. But no lab technician has endless time, thus a reasonable compromise between sufficient accuracy and measurement time is needed. The Novasina stable system is it exactly. By offering various settings, it can be perfectly adapted to sample properties, taking different water-sample interactions (van der Waals forces, hydrogen-bridges, coulomb forces etc) and layering effects (like liquid oil which stays on top of the water layer) into the account. But how does it work?

4.2.1 Working principle of Novasina Stable System

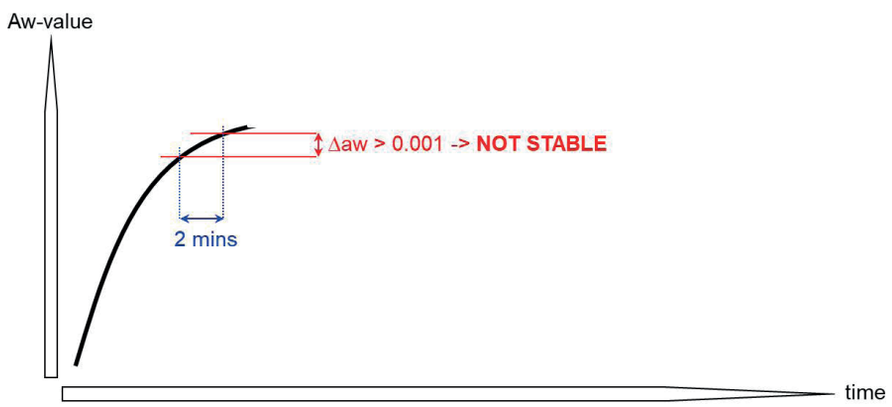
The basic layout is quite simple. Once the water exchange between free available water in the sample and humidity in the air move towards an eqilibrium, the net amount of water which is exchanged becomes smaller and smaller. Therefore, the change in air humidity /and water activity finally) becomes smaller in the same way.
Now, monitoring the change of water activity by time tells something about the degree of humidity equilibrium establishment.

Novasina's approach is to allow a change in value of 0.001aw (0.1%rH) within a certain time frame. And the time frame is what you have to program in menu „Chamber Settings" -> Stable Mode. You can select from various presettings or select a stability time manually. In this case, an additional submenu called „Stability observation time" is displayed.
For example, you program 2 minutes as stability observation time, then

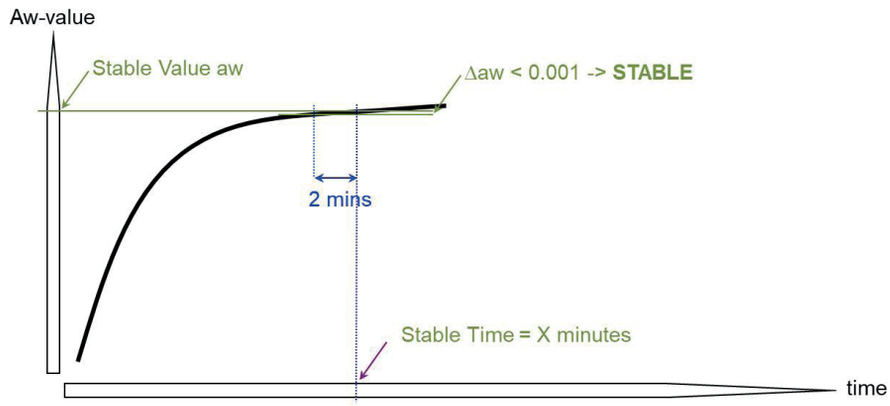
- it does not mean that measurement is finished within 2 minutes
- it means, measurement is performed so long, until measurement value does not change more than 0.001aw (0.1%rh) within 2 minutes.

Graphically, the stable system can be exaplined this way. Again, a stable time of 2 minutes has been programmed.

Measurement has started and instrument is always considerng the last two minutes and build the difference between entry and exit value:



The measurement continues until the change in water activity value is equal or less than 0.001aw in 2 minutes:



Once this occured the first time, measurement is considered as completed and acoustic signal is issued.

4.2.2 Selectable Stability Modes

As samples are different, Novasina offers different stability modes and settings to take the sample‘s properties into the account. The following modes and options are available:

- Slow: is equivalent to a stability time of 6 minutes.
- Average: is equivalent to a stability time of 4 minutes.
- Fast: is equivalent to a stability time of 2 minutes.
- ISO 18787: Measurement according ISO 18787:2017 standard with requirements in terms of temperature (25 +/-1°C) and determination of the final measurement point by reaching a plateau defined with a maximum amplitude of 0,0003aw, by three consecutive measurements and by stability over 1 min. By monitoring both stability criteria of the ISO standard, a wrong measurement by an initial over-or undershoot of the value due to temperature difference of chamber and sample can be avoided.
- Manual: a new submenu is available in chamber settings where you can enter the requested stability time in minutes.
- Quick: at-line mode for production, every measurement is finished within max. 10 minutes as long as temperature is set in the range of 20°C to 30°C
- Query: a query about the requested stability time is issued, every time a measurement is started.

Note: A stability time below 2 minutes is not recommended for batch release measurements in final QC as equilibrium could not be established in a way to ensure the stated specs.

4.2.3 Which mode for which products?

It is a difficult question and there is no generic answer. Your local Novasina agent can assist you in finding the best mode or stability time for your product. As a rule of thumb one can say, the drier the product, the shorter the stability time (or going towards F mode). The more long chain sugars are involved, go to A mode or stability observation time of 3-4 mins. Once fat/oil is involved, S mode or stability observation time higher than 5 mins are necessary.
It is also possible to find out yourself. Select „Manual“ as stability mode and then enter a stability observation time according to the rule o thumb above. Once measurement is finished, let the sample in the chamber for another 20-30 mins. If the actual value differs more than +/-0.005aw from the green displayed stable value, add another 2 mins to stability observation time and redo the measure-

ment, until you have no bigger shift once measurement is stable. That is your stability observation time for the currently measured product type.

Note: The logged data measurement data on the SD-Card can be displayed as a graph within NovalogMC. This might simplify the finding of the best stability observation time

4.2.4 Stable Indicator / Progress bar

For the ease of use, the progress of equilibrium establishment and stable conditions achievement based on user's programming is visible on the measurement screen, by a stable indicator (progress bar). In addition, other useful information around stability is displayed as well.

The stable indicator has two colors:

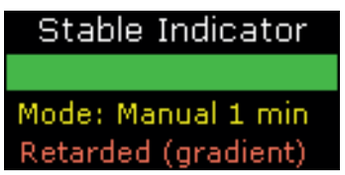
- Yellow indicates the remaining „time" to complete the measurement
- Green indicates the progress of the measurement

In other words, the greener the bar, the closer the measurement is to it's end.

The selected stability mode or the programmed stability observation time is listed below the progress bar.

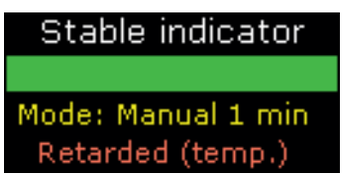
Depending on the settings and condition of the aw meter, it can occur that the progress bar is fully green but measurement is not considered as stable and stability is retarded (delayed). Respective information is displayed directly below the stable mode info in red color.

Retarded (gradient)



Progress bar is green, retarded (gradient) is displayed. In this case, the water activity value is questionable due to a remarkable temperature difference between sample surface (IR) and sensor. If message persists, open chamber, check, if measurement table and outer metal ring of measurement head are clean and free of dust and dirt and redo the measurement.

Retarded (temp)



Progress bar is green, retarded (temp) is displayed. It indicates that temperature control could not reach a stable target value. This delay and error message can be avoided by setting „Stability check temperature" to „OFF" in „Chamber Settings". However, it can occur that measurement will not be finished at target temperature +/-0.05°C. If temperature control is switched off, retarded (temp) is it as well.

4.2.5 Stability check temperature

This setting allows the user to distinguish between a measurement which is exactly at target measurement temperature or if it is also ok if temperature is just around it as by experience, some samples have a temperature coefficient of 0.002aw/°K, so even if current temperature is 2°C away from target, we speak about a deviation of 0.004aw from the final value. Something which might be neglectable, depending on the internal requirements in terms of water activity value accuracy.

Stability check temperture „ON"

Stability is reached if aw value is stable plus once sample has reached target measurement temperature +/-0.05°C. This mode ensures accuracy and precision as well as high repeatability but it takes longer as sample temperature must be exactly at target. Use this mode if you want to compare water activity values from batch to batch (quality trending) or different products. It is mandatory to record the values at the same temperature if you compare them!

Stability check temperture „OFF
Stability is reached once water activity value is stable (progress bar completely green). It can be that temperature has not reached target measurement temperature at that time but as mentioned before, deviations are sometimes neglecteble. Advantage here is that measurement is completed in shorter time as there is no delay due to not reached target measurement temperature.

4.3 Measurement Temperature Below Dew Point Temperature

Sometimes it is necessary and requested to perform a water activity measurement at sample temperatures below dew point temperature. Typical conditions once condensation can occur:

- Measurement at 25°C, lab temperature 30°C and air humidity more than 74%rH
- If lab temperature is 25°C and lab air humidity is 50%, sample temperature must be higher than 14°C, otherwise condensation happens on cold surface once measurement chamber is opened.

The following problems can appear if target measurement temperature is programmed to a value below the dew point temperature:

- Once the measurement chamber has opened, small water droplets are formed within the measurement chamber as the surface is very cold (remember the Coke you take out of the fridge on very hot summer days). This water acts as additional free water in consecutive measurements and will result in wrong values, moreover, you might classify good products as out of specs
- Once you open the measurement chamber, water flows down on the outside of the measurement head. This will also falsify consecutive measurements.

In both cases, dry the instrument by programming the sample temperature to 40°C and let the measurement chamber opened.

If possible, avoid measurements with sample temperatures below dew point temperature. If it is necessary, put sample into the aw meter, close it, change sample temperature from 25°C to the low requested temperature, perform the measurement and heat up to 25°C afterward BEFORE opening the measurement chamber! Or place the instrument in a cold environment. This lowers the chance of condensation on cold surface.

5. How to Conduct a Measurement

5.1 Conduct a first Measurement

However, even if there is a word that the first steps are the most difficult and challenging one, - honestly- forget about that. Doing a first measurement with the LabMaster-aw neo is simple as 1-2-3. Just follow the step-by-step instruction below:

1. Prepare sample in a way that the small portion is representative. Cut the sample in small pieces, grind it, homogenise it or use another way to create little chunks. Just do not use ceramics as it absorbs free water and can change the water activity value
2. Fill sample cup half to 3/4. Do not overfill as it will just squeeze sample into the protection filter which results in filter replacement or cleaning work
3. Program important parameter as measurement temperature and select appropriate stable mode / stable time. Feel unsure? Just read chapter 4.
4. Go to main screen and press „START“ button
5. Measurement will be finished once stability has been reached. In that moment, an acoustic indication (beep) is also released.
6. Open measurement chamber and remove sample. Always remove sample once measurement is completed. NEVER switch off instrument with sample or salt standards left in the chamber

6. Calibration and Verification

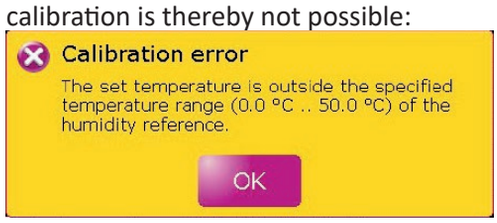
Contamination by volatiles and ageing of the sensor element can influence the accuracy of the measurement sensor. Due to that reason, it is necessary to verify the instrument from time to time. If verification fails, a two or more point calibration has to be performed.
Note: Within scope of supply, there are various salt standard with RFID chip which allows a flawless identification of used standard by the LabMaster-aw neo. Please use Novasina standards only to perform verification or calibration. Standards or own prepared liquids without RFID chip cannot be used for automatic verification and calibration.

Calibration needs less time if you start with salt standard values bottom-up, i.e. start with the lowest and end with highest value.

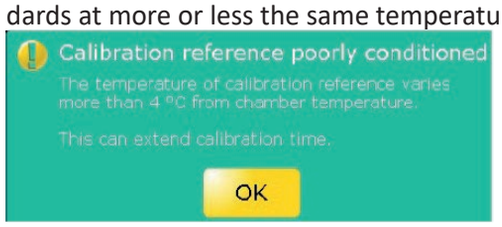
Important!

- If a chemical protection filter is mounted in front of the sensor, remove it as it just elongates the procedure. The mechanical protection filter which is installed by default must not be removed.
- Make sure the chamber is absolutely dry. If small water droplets are present, it might lead to wrong verification/calibration results.
- A calibration at 1.0000aw (SAL-T 100) mainly causes such small droplets of water, so please calibrate this point as the very last one in the row. Once finished, left the measurement chamber open for a while until small droplets have disappeared.
- Verification or calibration must be performed at a target sample temperature in the range between 15°C (59°F) to 30°C (86°F). If the temperature is not within this range, the following error message is displayed:

- If the temperature of the measurement chamber is outside of stored data range for each salt standard, the following error message is displayed. A calibration is thereby not possible:



- If surface temperature differs more than +/-4°C of the programmed target sample temperature, time for calibration is much longer than normal. It is indicated by a pop-up message as below. To avoid it, please store the standards at more or less the same temperature as target sample temperature



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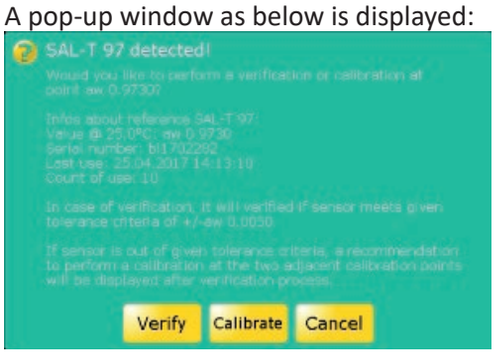
6.1 Verification

A verification does not change anything on the calibration values and is used as a measure to check if a calibration needs to be performed or not. Generally, a salt standard with a value which is within the normal measurement range is used for verification. Technically, it is not necessary to perform a verification before a calibration is executed.
An (automatic) verification can be performed only if a verification tolerance (aw or %rh) has been entered in „Chamber Settings“ -> „Sensor calibration“ -> „Verification tolerance“. Please refer to internal guidelines and/or SOP (standard operating procedures) to find out if your company has a certain verification tolerance in place. If not, a value of +/-0.005aw is best practice. If verification is out of tolerance, a calibration will be recommended.
As per default (from factory), any verification tolerance is programmed

6.1.1 Performing a verification

- Please make sure you have entered a verification tolerance in submenu „Chamber Settings“ -> „Sensor calibration“ -> „Verification tolerance“
- Take the respective salt standard you have identified as the most appropriate one for the verification. Place the salt on the RFID reader in the measurement chamber (indicated with RFID symbol) until you hear a short beep, then move the standard to the measurement position and close the measurement chamber.
- A pop-up window as below is displayed:

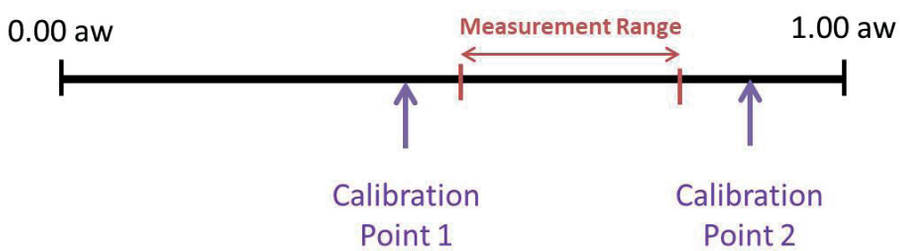


  It contains info about the used salt standards as theoretical value at 25°C, serial number, last usage and number of use.
- Please select „VERIFY“ to start verification process. If you have not closed the measurement chamber yet, a respective message appears.
- The verification process is performed automatically and can take between 16 to 60 mins. During this process, „Verify“ is displayed in the start/stop button. To abort the process at any time, simply press start/stop button.
- Once finished, stable beep is issued as an accoustic signal and a window containing the following information appears:
  - Calibration recommended (sensor verification -> CAL.RECOMMENDED) or Calibration not necessary (Sensor verification -> OK)
  - Target value, related to 25°C
  - Sensor Health (more info see chapter 6.3. Sensor Health)
  - Deviation from the actual reference value and if applicable, by how far tolerance has been exceeded plus the allowed tolerance
  - If user management permission allows, a query is displayed if a calibration should be directly executed at that point or not
  - If yes, a second query appears, if all calibration values should be deleted or not. Only delete all values if you plan to perform a full span calibration

Note: If instrument was logged-off during release of verification result, you can still start calibration at that point once you have logged-in by going to „Chamber Settings“ -> „Sensor calibration“ -> „Retrigger sensor calibration“

6.2 Calibration

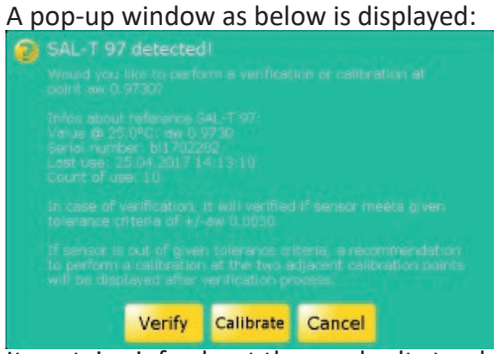
In case of calibration, performance of a sensor is changed. Necessary correction values will be stored in a non-volatile memory on the sensor to take drifts into the account.
The temperature dependency of the salt standards as well as the temperature gradient will be compensated automatically.
Within scope of supply, there are 6 ready to use and reusable salt standards plus an empty standard cup to be filled with pure water if the point 1.0000aw needs to be calibrated as well.
However, best practice is to use 2 or 3 salt standards to perform a bracket calibration, means at least one value lower and one higher than the normal measurement range of the samples:



Are calibration point 1 and point 2 more than 0.40aw apart, it is recommended to use a third calibration point in between.

6.2.1 Performing a calibration

- Take the respective salt standard and place it on the RFID reader in the measurement chamber (indicated with RFID symbol) until you hear a short beep, then move the standard to the measurement position and close the measurement chamber.
- A pop-up window as below is displayed:



  It contains info about the used salt standards as theoretical value at 25°C, serial number, last usage and number of use.
- Please select „CALIBRATE“ to start calibration process. If you have not closed the measurement chamber yet, a respective message appears.
- If sensor is password protected, you will be prompted to enter it now.
- Then calibration is started and performed automatically. It can take between 16 to 120 mins. During this process, „Calibrate“ is displayed in the start/stop button. To abort the process at any time, simply press start/stop button.
- Once finished, stable beep is issued as an accoustic signal and a window containing a calibratiuon successful or calibration failed note is displayed.
- As long as the measurement chamber is not opened, you can retrigger calibration as often as required. To do so, go to „Chamber Settings“ -> „Sensor calibration“ -> „Retrigger sensor calibration“

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6.3 Sensor Health Indicator

Based on the necessary correction (current value compared to the factory calibration value) at a calibration point, a sensor health (100% to 0%) is calculated.
A calibration point can not be calibrated anymore, if sensor health is down to 0%.
If sensor health is below a certain threshold value, which is individual for each calibration point, a warning message is displayed. This message includes the hint, that sensor is close to end of lifetime and cannot be calibrated soon. In this case, please contact your local Novasina agent to order a new sensor for replacement.
Note: For the mentioned warning message, the calibration point with the worst sensor health is always considered. This calibration point is also listed in „Chamber settings“ -> „Chamber info“ under entry „Worst Health“

Important!
The displayed sensor health in the submenu „Information Calibration“ at the respective calibration point is only brought up to date once a calibration had been performed at that point. In case of a verification, sensor health will be simulated and displayed after the process but not stored on the sensor and thereby the Information Calibration“ submenu is not updated.

6.3.1 Sensor Exhausted Warning
This warning is issued in case of an exhausted sensor

- After completion of a calibration
- After completion of a verification

In addition, a „Sensor nearly exhausted“ message is diplayed in red color in the status bar.

Hints:

- The „health“ of a sensor which was contaminated by volatiles can get better if the contaminants outgass from it, thus provide less influence to sensor drift.
- A bad sensor health does not mean that mesurement results become less accurate. Moreover, it provides conclusion if a sensor has to be changed soon or needs to be potected from volatiles by installing a chemical protection filter.
- If sensor health is reduced dramatically within a few weeks, the use of chemical protection filter must be considered as the drop in health results from chemical contamination of the sensor by volatiles.

6.4 Sensor Calibration Submenu

All calibration functions are offered in this submenu. Go to „Chamber Settiungs“ -> Sensor calibration“ to access it.

Menu Point	Description	Note	Factory Settings
Retrigger Sensor calibration	Repeat a calibration. Necessary, if • Verification has been completed without a logged-in user. A user can now log-in and perform a calibration, if applicable • A user leaves the salt standard in the closed measurement chamber after calibration and realises, that value has still changed a bit. In this case, calibration can be restarted again*	This menu point is only displayed if a verification or calibration has been performed and measurement chamber has not been opened	
Clear calibration point	Deletion of calibration points	• A deleted calibration point delivers better results as a wrong or very old one • Only the calibrated points are listed in info cal points	

Info calibration point	• Display or print of all calibration points
	• Display of extended calibration info per point as:
	  • Date
	  • User
	  • Instrument info, on which calibration has been performed
	  • Sensor Health
	  • Temperature
		• Only the calibrated points are listed
		• Depending whether a printer or a PC is connected, a pop-up windows appears in which print destination can be selected	

Set sensor password	Set a sensor password	**Important!** If a sensor password has been forgotten, sensor must be returned to Novasina Switzerland for performing unlock procedure	8808
Warning expired calibration	Remider for performing calibration. Once the entered time has passed, a recommendation for calibration is issued		Off
Verification tolerance	Allowed deviation of current water activity value to the theoretical value of before verification fails and a recommendation for calibration is issued	If set to „Off“, verification is not available	Off
Warning filter exchange	• Time, after which a recommendation for filter exchange is issued as a pop-up window • Reset filter warning	Filter warning timer should be reset after replacement of chemical protection filter by „reset filter warning“	Off
*	The parameters for processing the automatic calibration is a compromise between speed and accuracy. If the salt standard remains in the instrument for hours, the measured water activity value can still change, even if the change is very little. The function „Retrigger sensor calibration“ helps, if user thinks that deviation is now too big and want to balance this residual deviation.		

6.5 How to Handle SAL-T Standards Correctly

The Novasina SAL-T standards are not labeled with a due date. The shelf-life itself depends on the handling and storage conditions. Experiences in the field have proven that those standards can be good for 3-5 years if handled correctly. To achieve the best possible shelf-life, please shake all SAL-T standards twice a month for one minute, nevertheless if you have used them or not. There is no need to take it out of the plastic container.
Always store the standards in the plastic container (closed cover) and not exposed to direct sunlight.
Do not expose the salt tablet to environmental air for longer than necessary; thus, put it back into plastic container once calibration has been finished at the particular point.

Please always double-check, if the SAL-T standards below 33%rH contain no or just few water and all the others are present as slurries (salt/water mixture). Contact the local representative if you feel unsure, how to handle the SAL-T standards correctly or feel uncertain if the existing ones are still in good shape.

7. Plot of Measurement Sequence

The LabMaster-aw neo offers great opportunities to plot and analyze a measurement sequence, especially, if a new product is tested and running-in sequence is not very well known.
All plots and graphics data on the screen will be deleted once instrument will be open upon a completion of a measurement or a new measurement is started.
For a permanent storage of recorded graphic data, the usage of Novasina's NovalogMC PC software is recommended.

7.1 Activation of plotting of measurement sequence

It is very simple, just go to the Main menu and select „Display". In the pop-up window, select „Graph". That's it.

7.2 Basic configuration of the plot

Go to „Main Menu" -> „Chamber Settings" -> „Graph parameters". There, the following options are available:

Menu Point	Description	Note	Factory Settings
Range Humidity (Display y-axis)	Range of humidity (aw) to be displayed (biggest - smallest value). Allows a zoom in a way.	Offset of y-axis is adjusted automatically so that the latest values are displayed.	0.0500aw
Range temperature (Display y-axis)	Same like „Range humidity" but for temperature.	Is displayed on the y-axis as well	5.0°C
Time/div	Time segment per division	If anything has been changed in „Graph Analyzing" menu (see chapter 7.3.), plot is shifted in a way that end of it is always visible.	4 min

7.3 Graph Analyzing

The „Graph Analyzing“ allows a user to zoom-in to the plot and to deactivate the basic plot configuration temporarily. This might be necessary to see and analyze some specific details of the plot.
The „Grah Analyzing“ can be accessed by touch the graph area on the measurement screen (more details about measurement screen in chapter 3.1.) or the middle area of the measurement screen if „graph“ is not activated.
Once „Graph Analyzing“ is active, the graph is displayed in a separate pop-up window in large size and the following zoom options are availabe:

Button	Description
	Skip to the start of the graph.
	Scroll backwards.
	Scroll forwards.
	Skip to the end of the graph. If a black dot is visible, graph is scrolled to the end automatically so that the latest values are always displayed.
	Skip to stable point. This button is only displayed if measurement has been stable.
	Graph is reset, parameters as programmed in "Graph Parameters" menu are used. A preset is also done if chamber is opened or a new measurement is started.
	X-axis zoom in.
	X-axis zoom out.
	Zoom X-axis is set in a way that all data is displayed.
	Select, if humidity (aw) or temperature should be displayed on Y-axis. The color of the curve in the Y-axis zoom buttons is changed accordingly (blue = humidity, red = temperature).
	Y-axis zoom in.
	Y-axis zoom out.
	Zoom Y-axis is set in a way that all data is displayed.

8. Recording of Measurement Values

This chapter describes, which options a user can select from to record measurement values.

8.1 Useful information about recording values with LabMaster-aw neo

- Measurement values can be recorded in a freely selectable interval between 2 to 60 secs.
- In addition, it is possible to store measurement protocols (actual and stable) as digitally-signed text files.The recorded data can be read-out and displayed with Novasina's NovalogMC software or with Excel as well.
- All data will be stored first on the instrument but can be exported to the SD-Card, which is within scope of supply.
- A directory named „Ch0" is created automatically.
- Log-files (XXXXLOG.txt) and protocol files (XXXXPRO.txt) are stored in this „Ch0" directory. XXXX respresents the sample number.
- The structure of the directory on the SD-Card is „serialnumber\Log\Ch0"

8.2 Recording of a Measurement Sequence

Prior to start the measurement, configuration must be done accordingly. This includes the following settings in „Chamber settings" -> „Data logger":

- Product name:
  Name of the product. It is mentioned the in the header of the records. This field can be left empty, if no name is applicable or necessary
- Sample number:
  - Serves as allocation of a protocol to a sample. This sample number is displayed in the chamber area of the measurement screen plus is used as part of the file name.
  - If a file with the same sample number exists already, it will be overwritten, as soon as the measurement has started.
  - Sample number is increased with each consecutive measurement.
  - The current sample number is displayed in chamber area of the measurement screen.
- Interval recording:
  Enter here, in which time interval measurement data should be stored on the SD-Card. A value between 1 sec. up to 99 sec. can be programmed. If value is deleted or any value has been entered, logger is switched-off.

Hints:

- Certain settings of the logger will just be activated once a new sample has been placed into the measurement chamber, means, if chamber has been opened and closed.
- Place a sample into measurement chamber and start the measurement. As long as a „Sample: (rec) # XXXX is displayed in the chamber area of the measurement screen, a measurement is active and on-going

- Measurement will continue until sample chamber has been opened or Start/Stop button has been pushed.
- A stopped logging will only be restarted if a new measurement is active as sample number will be increased.

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8.2.1 Capacity of Data Storage

It is one of the most asked questions when it comes to internal data storage: How much space is there and how many data can be stored?
Herewith some facts about the storage used in LabMaster-aw neo:

- There are a maximum of 65‘500 datasets per log file. If this number has been reached, record stops automatically.
- A maximum of 500 files can be stored
  - A measurement protocol (see chapter 8.3) counts as a file as well. That means, you can record 500 samples without a protocol or 250 samples with a protocol.
  - A warning message is displayed if there is just space for less than approx. 20 files.
  - If all storage space is used, an error message appears and logging is not started at all.
  - It is recommended to export (see table 8.2.2.) logged data to the SD-Card daily to several times a week and delete the logged data in the instrument afterwards. By this it is ensured that enough internal memory for data storage is available.

8.2.2 Data Logger Menu

Menu Point	Description	Note	Factory Settings
Product name	Name of Sample	Will be stored in recorded data	
Sample number	Sample number for next measurement	This number will be increased automatically, as soon as a new or consecutive measurement has been started.	
Interval recording	Interval of measurement data storage	If any value is entered, log function is switched off	
Export to SD-Card	Data will be exported from internal storage to SD-Card. After the export, query comes up if exported data should be deleted from internal memory	It is possible to export data of an on-going measurement to SD-Card. The log data can be analyzed with NovalogMC software	
Delete log data	Log data will be deleted in internal memory	The XXXXLOG.txt file from an on-going measurement will not be deleted in that case	
Automatic output of stable protocol	Automatic release of a stable protocol, see chapter 8.3	• Off: Not activated • Log: Store protocol in internal memory. Can be exported later to SD-Card • PC: Protocol will be transferred to PC and displayed in NovalogMC • LOG+PC: Both options mentioned above.	
Laboratory	Name of laboratory or group	Will be stored in recorded data	
Batchname Input	Query batch name at measurement start	see chapter 8.4	OFF

8.3 Measurement Protocols

Finished measurements can be logged / recorded. Those protocols can be viewed by the NovalogMC software or by a normal text editor.
As the file has a digital signature, viewing the protocol by NovalogMC offers the advantage that fraudulent and unauthorized changes of the protocol are recognised.

8.3.1 Automatic Storage of „Stable Protocol“

Please proceed with steps mentioned below, if it is requested that stable protocol is stored after measurement has been finished:

- Go to „Chamber Settings“ -> „Data Logger“ -> „Automatic output of stable protocol and select
  - Log: Store protocol in internal memory. Can be exported later to SD-Card
  - PC: Protocol will be transferred to PC and displayed in NovalogMC
  - LOG+PC: Both options mentioned above

If „Off“ is selected, automatic output of stable protocol is deactivated. A manual output can still be made (see chapter 8.3.2.), if LabMaster-aw neo is connected to a PC with running NovalogMC.

8.3.2 Manual Release of a Protocol Print

Once a measurement has been started, a manual print of a protocol can be triggered by selecting „Print protocol“ on the main menu screen. Please consider as well that a local EPSON TM-U220D printer or a connection to a PC with running NovalogMC is available. It is not possible to „print“ the protocol to the SD-card. For an on-going measurement, only „actual Protocol“ is available, for a finished measurement, a „stable protocol“ can be printed.

8.3.3 Connect a Local Printer

It is possible to connect a local printer to the RS-232 interface of the LabMaster-aw neo to get a paper print-out of the protocols.

Important!

There is only one type of printer which is supported and this is the EPSON TM-U220D! As additional adapters are necessary, it is recommended to order this printer at Novasina, respectively at your local Novasina distributor.

To connect this printer to a LabMaster-aw neo, please proceed as follows:

- Prepare printer as per instructions, given in the manual which comes along with the printer (Doc. No. 003613). Special attention needs to be paid to setting the DIP switches correctly
- Connect printer and RS-232 interface at LabMaster-aw neo using the specific adapters and cable as per instruction.
- Go to „System Settings“ -> „Maintenance“ -> „Interface for computer connection“ and select „Printer on RS232 (EPSON TM-U22D)
- Stable protocol can now be printed as mentioned in chapter 8.3.1

Note:

The USB interface is only be used for connection to a computer and to log by NovalogMC.

8.3.4 Connecting to LIMS (Lab-Information- and Management-System)

LIMS integration became more and more popular recently, especially in terms of data integrity. The LabMaster-aw neo is capable to release measurement results and meta data in XML format which can then be implemented into LIMS easily.

There is no limitation in terms of the LIMS system to be used, as long as XML data can be implemented. There is as well an Excel application where XML can be read on a computer and then can be seen, which code line reflects what data. This simplifies the integration into LIMS also.
To activate XML output, please proceed as follows:

- Go to „System settings“ -> „Maintenance“ - > „Interface for computer connection

„XML on USB (e.g. LIMS)“ or „XML on RS-232 (e.g. LIMS)“, depending on the interface the information has to be put through

- Go to „Chamber settings“ -> „Data logger“ -> „Automatic output of XML LIMS data“ and select, when and how the data output has to be made:
  - ☐ Off: No output
  - ☐ At stable: Automatic output once stability is reached, e.g. output of stable value.
  - ☐ Manual: Output only if „Print protocol“ button in main menu is pressed
  - ☐ At stable+Manual: Automatic output once stability is reached, e.g. output of stable value. In addition, output by pressing print protocol“ button in main menu is also possible
  - ☐ Information on the format of the data can be found in Appendix 18. 1.
  - ☐ If the Lims output is activated, the 2nd remaining interface for the NovalogMC PC software is available or Novax communication.
  - ☐ The connection of a printer is not possible with activated LIMS output.

8.3.4 XML Data for LIMS
Please see below the xml data format for LIMS integration:

```
<?xml version=“1.0“ encoding=“utf-8“?>
<LimsXmlData xmlns:xsi=“http://www.w3.org/2001/XMLSchema-instance“
xmlns:xsd=“http://www.w3.org/2001/XMLSchema“>
 <Instrument>
  <Instrument>LabMaster-aw neo</Instrument>
  <MasterFw>V0.00</MasterFw>
  <Chamber>
   <Chamber>LM-aw neo</Chamber>
   <ChamberSnr>1709032</ChamberSnr>
   <ChamberFw>V01.03</ChamberFw>
   <HumSens>awSens-ENS</HumSens>
   <HumSensSnr>ae1707006</HumSensSnr>
   <HumSensFw>V01.02</HumSensFw>
   <IrSensFw>V00.05</IrSensFw>
  </Chamber>
 </Instrument>
 <Lab>
  <User>Default user</User>
  <Lab>Novasina</Lab>
 </Lab>
 <Sample>
  <Product>Novasinen</Product>
  <Batch>1234</Batch>
  <Nr>48</Nr>
 </Sample>
 <Settings>
  <StabMode>Manual 01 min</StabMode>
  <SampDb>Novasinen</SampDb>
 </Settings>
```

<Measure Kind="Stable">
<TimeStamp>2018-10-12T16:57:58</TimeStamp>
<Duration>60</Duration>
<Temperature>25.02</Temperature>
<aw>0.033</aw>
</Measure>
<Security>
<PublicSigKey>
<Exponent>AQAB</Exponent>
<Modu-lus>1uEKLSGhaIb4Aig+2PIHKa+vkS99HWw7o3E9sZyJi7fpPxVsX1NrXT
d++p4QwqwXMtaVuE1f9qbcTNbM+QL6CWovuwzumjF70PrNf6s
KIMBCeuTQyhZ36BWvxVQGH4Y6fpiPeI3veHtP0Gu53IzdcyRKywh7FvxdAd-
WQtaKlrxk=</Modulus>
</PublicSigKey>
</Security>
</LimsXmlData>
<!--EOPD:1334-->
<!--CRC32:F2-6A-F6-72-->
<!--RSA-SHA1:eNx5sNw4pVl64Zc2aClz5b9giXXbvmlEKvaWYx4iGSIUH8QmXw6Fnz
at4rWJJ6/juTgSx3jStTz+0bKf+7faSq/MLkIZu38cRXQvOzJjfG5QkFGzmokHXvJObM-
GeJ1QgfaOFxxOMOvyDzEiPq70s7iDwcV38A6TqeocUCQ1TaEg=-->

<!--EOT:1568-->

Tag	Description	Units
Instrument		
Instrument	Name of Instrument	
MasterFw	Firmware Version master board (user Interface)	
Chamber	Name of measurement chamer	
ChamberSnr	Serial number of measurement chamber (equal to instrument serial number)	
ChamberFw	Firmware version of measurement chamber	
HumSens	Name of humidity sensor	
HumSensSnr	Serial number humidity sensor	
HumSensFw	Firmware version humidity sensor	
IrSensFw	Firmware version IR-sensor	
Lab		
User	User (who has started the measurement)	
Lab	Lab name which has been entered in „Chamber settings"-> „Data logger..." -> „Laboratory"	
Sample	Product name, Batch and sample number if entered	
Settings	Stable mode Used sample database	
Measure TimeStamp	Time stamp of reached stability	
Measure Duration	Duration of measurement	s
Temperature	Surface temperature of sample surface	°C
Security PublicSigKey	Used public key to calculate the RSA-SHA1 signature	

<!--EOPD:-->	EndofProtectedData: As of the mentioned byte data is no longer protected my CRC and signature Example: <!--EOPD:1334--> means that bytes 0 .. 1333 are used for CRC and signature calculation!	
<!--CRC32:-->	CRC-32 value (ethernet compatible) Dies value is used to detect transmittion errors	
<!--RSA-SHA1:-->	Data Signature to detect file and/or value tampering. If receiver verifies and check this signature, a CRC-32 check can be renounced.	
<!..EOT:-->	EndOfTransmission: This tag can be used to detect the end of the transmission. After the double point, number of transmitted bytes just before of this will be outlined.	

8.4 Enter batch name and its use

There is a possibility to enter the sample batch name just before starting a measurement.

- The batch name is listed on the actual and the stable protocol. If those protocols but as well log files are stored on the SD-card, the batch name is integrated into the file name (i.e. 0057_XXXX_LOG, whereas XXXX reflects the batch name
- A batch name is limited to 19 characters and is allowed to contain characters: A..Z, a..z, 0..9, space, hyphen, underline, point and comma only
- A batch name can just be entered at the start of first measurement. If a measurement is restarted without opening the chamber, the entered batch name is reused

8.4.1 Configuration

To activate the batch name input at measurement start, go to „Chamber settings“ -> „Data logger...-> „Batch name input“. The following options can be selected off:

- Off: Batch name query at measurement start is off
- Scanner: Batch name at measurement start is entered by a wireless barcode scanner which can be purchased separately. This option is very suitable for labs where data integrity is a necessary topic. This option does not require entering the batch name / batch ID manually.
- Touch Keyboard: Batch name at measurement start is entered manually by a keypad which appears o the screen.

If „Scanner“ has been selected, a separate scanner connection test windows appears, containing two different barcodes. Those two barcodes must be scanned by the wireless barcode scanner. If a scan was successful, the respective barcode disappears.

- Please note that incidence of light or reflections on the display can cause difficulties to scan the displayed barcodes. If so, try to scan in a different angle or relocated the instrument
- This test is mandatory to ensure proper communication and barcode reading of wiress barcode scanner with LabMaster-aw neo
- If test was not successful, the last setting remain

Important:

- Perform this test if you have replaced the wireless barcode scanner or changed its configuration
- The barcode scanning test can be performed on a regular base (for OQ) by

selecting „System settings“-> „Maintenance“ -> „Verify barcode sanner“.
A respective entry in audit trial will be made as a proof. This option is only available if „Batch name input“ is set to „Scanner“.

8.5 How to install the wireless barcode scanner

1. Preparation

Make sure, you have purchased a wireless barcode scanner set, P/N 26601698 from Novasina. Please note that just this set works with the LabMaster-aw neo, any other wireless barcode scanner will neither work not are supported by Novasina.
If you have ordered the wireless barcode scanner together with a LabMaster-aw neo, Novasina took already care for the implementation and you don‘t have to proceed with the tasks listed below.

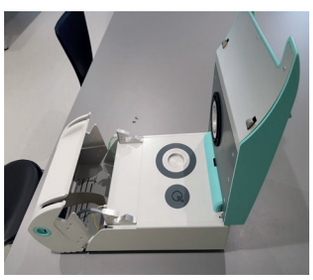
To perform these tasks, you need the following tools:

- Torx wrench size 20:

2. Installing the wireless barcode scanner board

- Shut down LabMaster-aw neo and wait until instrument has switched off completely
- Remove power cord
- Remove the two screws which fix the front module of the LabMaster-aw neo by using the Torx wrench 20:

- Thoroughly tear on the front module to loosen and to remove it:



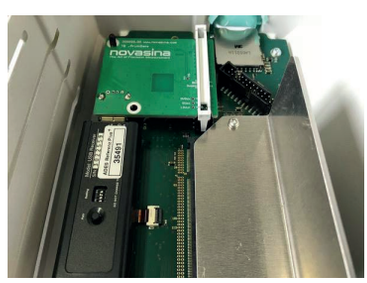
- Loosen the grey ribbon and the power plug (yellow color) from the front module and remove the front module completely:

- Take the box with the wireless barcode scanner, open it and make sure you find the following items:

1. Wireless barcode scanner

2. ESD bag containing a board and plugged-in adapter

- Take the board and mount it on top of the display board which can be found in the front module of the LabMaster-aw neo as shown in the pictures below:



- Once done, mount the LabMaster-aw neo front module back to the LabMaster-aw neo housing

<u>3. Connecting the wireless barcode scanner to LabMaster-aw neo</u>

To use the wireless barcode scanner in conjunction with the LabMaster-aw neo, validation of the connection must be made.

- Go to „Main Menu“ -> „Chamber Settings“ -> „Data logger“ -> „Batch name input“, then select „Scanner“

- A „Scanner Test“ message is displayed:

Before proceeding with this test, make sure you pushed the green button on the scanner to switch it on. A beep confirms it acoustically. Then press „OK“ button

- Two barcodes are displayed. Scan one after the other with the wireless barcode scanner. Maybe you have to try several times with different angles as reflections by the touch screen can disturb. If you managed to scan the first barcode successfully, it disappears.

- Once both barcodes are scanned successfully, the Data logger submenu is displayed again. Installation is completed at that point and wireless barcode scanner can be used

9. Audit Trail

The LabMaster-aw neo is equipped with a fully 21CFR11 compliant audit trail. All manipulations by users, system events, technical incidents, etc. are logged and can neither be deleted nor changed by a user, even if the user has full permission rights on the instrument. The entire history of the instrument can be analyzed and also be exported to SD-card.

The records of the current day are displayed in the audit trail area on the measurement screen. By pushing on that area of the screen, a new „audit trail analysis“ window is opened where all entries can be viewed.

The internal memory capacity for the audit trail is limited to 365 days of instrument operation. After that period of time, the oldest entries will be deleted. To avoid a loss of important and usefull data, it is strongly recommended to export the audit trail from internal memory to the SD-card daily. Make sure as well that data on the SD-card are backed-up regularly.
To export the internal audit trail data to SD-card, go to „System settings“ -> „Maintenance“ -> „Audit trail (Export)“. Export is carried-out into the main directory of the SD-card. The file is named like „serialnumber.atr“.

Note:

- The .atr files have XML format and can be viewed by a XML or a text editor
- It is not possible to import an audit trail to an instrument.
- It might occur that a Novasina service technician is asking for the .atr file in case of getting a better understanding of a support case or a technical incident
- Keep in mind that audit trail data can be lost due to a technical incident, thus, regular export and back-up helps keeping track of the instrument's history.

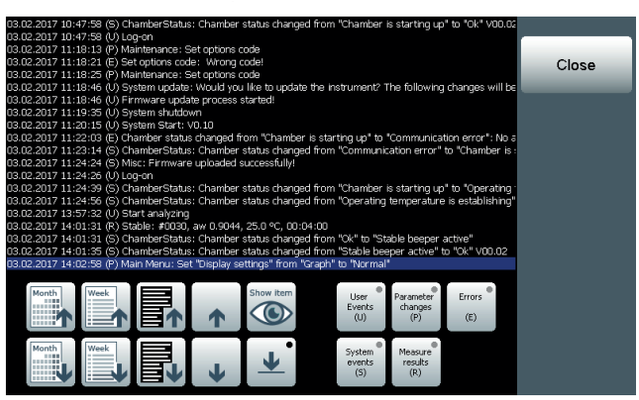
9.1 Incident Groups in Audit Trail

Each audit trail entry has a letter in brackets in front of the text. This letter indicates a group, like the kind of incident:

Group	Examples
User Events (U)	• Log-in, log-off • Start of measurement • Open measurement chamber • Confirmed messages by user
Parameter changes (P)	• Change measurement temperature • Change password • Back-spacing filter exchange warning
Errors (E)	• Log function deactivated due to insufficient internal memory • Internal errors like crash of applications etc.
System Event (S)	• Calibration warning • Filter exchange warning • Change of status of measurement chamber
Measurement Results (R)	• Stability reached, stable value, measurement results • Result of verification • Result of calibration

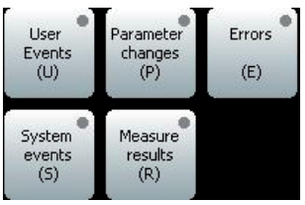
9.2 Analysis of Recorded Audit Trail Events

To access the audit trail analysis features, tap on the audit trail area on the measurement screen (location see chapter 3.1.)
A new window is opened:



The following options are available to analyze the audit trail, including selecting specific events or days:

ENGLISH

Button	Description
	Scroll forth and back in steps of: • Month • Week • One Page • One line
	Scroll to latest data. If a black dot is visible in the right upper corner of the icon while new entire are coming , scrolling to the latest entries is done automatically.
	Select an entry and gather more details while tap on „Show Entry“ button.
	Select the group(s) of events to be displayed. Groups can be seen in chapter 9.1. a black dot in the upper right corner indicates active selection of that particular event group, a grey dot indicates inactivity. If the audit trail analysis window is opened, all groups are active as per default. If all groups are deactivated, system goes to default settings which is deactivation of all event groups and displaying all entries.

10. Sample Database

In some cases, different types of products are measured in one facility. Each product type has its own stability settings. In order to aviod time-consuming reprogramming, the LabMaster-aw neo offers sample database capability.
In other words, specific settings for each product type can be stored in the instrument and easily activated when used.
The following parameters can be set individually per product type:

- Measurement temperature
- Settings of stability system
- Graph parameters
- Data logger -> Product name
- Data logger -> Interval recording

Note:
Unauthorized changes in a sample database can be avoided by programming the correct permissions in the user management (see chapter 11).

10.1 How to Create a Sample Database Entry

Please proceed with steps below to create a new sample database entry.

1. Program the settings (measurement temperature, stability mode etc) on the instrument as necessary to measure the specific product type.
2. Push „Sample Database“ button which is located int the right upper corner of the measurement screen
3. If any database entry has been made, a pop-up appears which confirms there is no entry. Press „OK“

4. In the consecutive window, press „File operations“ button
5. In the new window, select „Save actual settings to sample database“
6. A new pop-up containing a summary of all paramaters is displayed. Confirm the parameters by pressing „YES“ button
7. If some entries exist already, they will be listed at that point. Select an existing entry if an existing method should be overwritten or select „New entry“ if a new method needs to be created.
8. A key pad is appearing where a method name can be entered. A note is indicating if the entered name does exists already, otherwise, a success note is displayed.

10.2 Load a Method

1. Push „Sample Database“ button which is located int the right upper corner of the measurement screen
2. In the consecutive window, hit the name of the method which needs to be loaded, then select „YES“ in the following window listing all parameters which will be loaded
3. A success note is issued

Hint:
The name of a selected and activ method is displayed in the chamber area of the measurement screen.

10.3 File operations

While loading an existing method or creating a new one, there is always a „file operations“ window popping-up. The following options can be selected from in this window:

- [Save actual settings to sample database]: Current settings are used to create a method.
- [Delete Record]: Deletes a stored sample method.
- [Export data to SD-card]: Export a sample method to the SD-Card.
  - All records/methods are stored as *.SDR file in the main directory of the SD-card
  - Existing records/methods on the SD-card with same method name will be overwritten.
- [Export all data to SD-card]: Same principle as [Export data to SD-card] but all stored sample methods are exported at once
- [Import record from SD-card]: Import af a stored sample method on the SD-card
  - The stored method/record file must be located in the main directory of the SD-card and must be a *.SDR file

10.4 Templates

Novasina can provide ready-to-use methods (so called templates) for some product types. They have a *.SDT file format. Those templates can be imported by proceeding the sequence [Sample Database] -> [File operations]-> [Import record from SD-card].

Note:
Templates differ from stored sample methods by the following properties:

- Will be displayed in magenta color
- Can not be overwritten but can be deleted from the LabMaster-aw neo
- Cannot be exported

11. User Management

The LabMaster-aw neo user management offers the ability to deny unauthorised access or changes in settings on the aw-meter itself. It is a vital function in laboratories and in production environment where various people from different departments need access to the instrument. Selective permission can be granted by an administrator.
Based on many customer feedbacks, especially from the pharmaceutical industry, Novasina has implemented a user management which is 100% compliant with 21CFR11 requirement and thereby can be used to establish the well-known 3-level permission management which is best practice in pharma environments and works also well under GMP/GLP guidelines.
The user management in combination with the audit trail allows a tracking of measurement and change in parameters down to a specific user.

The user management of the LabMaster-aw neo work differently to predecessors or other instruments from the Novasina water activity meter portfolio.

To set-up a user management successfully, the following steps need to be performed:
1. Design the requested user management (which user has which permission).
2. Program permission profiles (i.e. QC-lab, production, R&D etc).
3. Create user accounts per user and allocate with the respective permission profile.

The advantage of such permission profile / user account set-ups is obvious. If a person quites the job, there is no need to delete a complete permission set-up. Only the user account needs to be deleted and things are done. Same if a new person joins the team. No time-consuming permission programming needs to be performed, simply a new user account has to be created and to be allocated with an existing permission profile according to the job function of the respective person.

11.1 Basic Functionality of User Management

The user management consists of a random number of „permission profiles“ which are allocated at a random number of user accounts.

11.1.1 How to Create a User Account with Respective Permissions

This is a step-to-step guidance how a designed user management is transferred into the instrument with proper permission profiles and allocated user accounts.

- Create a permission profile:
  - Go to „System settings“ -> „User management“ -> „Permission profiles“ -> New permission profile“
  - Enter a specific name for the profile (QC-lab, production, R&D etc.) and confirm by pushing the „tick“ button
  - In the following window, named „Copy from“ select „NONE (default without permissions)“
  - A new window appears with all permission settings for that profile. Now you can adapt permissions to allow or deny access to certain functions. An overview about each adjustable permission can be seen in chapter 11.3.1
  - Once all permissions are set accordingly, push „close“ button to return to User management menu.

- Create a User Account
  - Go to „System settings“ -> „User management“ -> „User accounts“ and select [New user account] in the Select user account window
  - Enter a user name (like Miller) and push the „tick button“
  - Configure the user account in the next window:
    First: Allocate it to a permission profile. To do so, hit the [Permission profile] button and select the respective profile the account has to be allocated to.
    Second: Set a password by pushing the [Password] button. Confirm password by hit the „tick button“.
  - Touch „close“ button to finish configuration

Important!

- Protect the default user with a strong password as well. To do so, go to „System settings“ -> „User management“ -> „User accounts“ and select [Defaul user]. In the subsequent window, hit [Password] and enter a strong password. Confirm with „tick“ button.
- Please pay attention to protect all user accounts which have permission to change settings in the user management with a strong password.
- By selecting [List user accounts] in menu „User management“, an overview will be given, which user account is allocated with which permission profile. User accounts, which are not password protected are marked in red color.

11.2 Security Features of User Management

Please read the following security features of the LabMaster-aw neo user management carefully!

- A user cannot edit the permission profile which his account is allocated to.
- A permission profile which is allocated to at least one user account cannot be deleted. In this case, a info is issued, which user accounts are allocated to it and prevent an erasing.
- There must be one user account at least which can administrate user accounts. By this, a lockout can be avoided.

11.2.1 Reset a Forgotten or Lost Password

Due to 21CFR11 compliance, there is no master password which can unlock a user account. Users with respective permission can do it. If administrators/ single user have forgotten/lost the password, please proceed as follows:

- Enter GET CDSE instead of user password in log-in window.
- There is a pop-up window where a code is displayed. Please take a picture.
- Ask you local Novasina distributor to send you the GET CDSE authorization form and instruction. Form must be signed by a supervisor.
- Send back a scan of the form plus the picture of the dispalyed code to the Novasina distributor.
- You will receive a service code from the Novasina distributor which you have to enter in the prompted window.
- Now the profile can be accessed and new code can be set.
- This process is as well recorded in the audit trail.

Note:

- Getting a new service code is not free of charge!
- The service code can only be used once
- The service code becomes invalid in case of a successful login
- If instrument has been switched of before service code has been entered, switch on instrument, enter GET CDSE again, hit „YES“ in service mode window and enter service code.

11.3 Administration of Permission Profiles

Permission profiles can be adjusted or created by users which are allowed to perform such modifications.

- Go to „System settings“ -> „User management“ -> „Permission profiles“
- The following options are available in the opening window:
  - Open an existing permission profile to modify it
  - Create a new profile by hit [New permission profile]
  - Delete an existing profile by pushing [Delete permission profile]

Hints:

- If a permission profile is modified, modification are valid for all user accounts allocated to this permission profile
- A permission profile which is allocated to at least one user account cannot be deleted.

11.3.1 Adjustable Permissions within Permission Profiles

The table given below contains all adjustable permissions whithn a permission profile. Please set permission according to the permission policy and regulation of your company.

Name	Permission	Additional Info
Profile name	Name of the permission profile	System verifies, if name is unique
Start analyzing	Permission to start a measurement	
Sample database	Permission to use sample database	• None: Sample database is not accessible • Load: Load methods only but no sample database editing • All: Load and editing of sample database
Printout protocol	Button „print protocol“ is not accessible	
Temperature control	Permission to change and set measurement temperature	
Stable system	Permission to configure stable system	Permission affects the following settings / menu points: • Stable Mode • Stability observation time • Stability check temperature
Graph parameters	Permission to configure graph parameters	
Data logger	Permission for data logger configuration	• None: No configuration possible • P: Permission to enter product name • PE: Permission to enter product name and export data to SD-card • PS: Permission to enter product name and sample number • PSE: Permission to enter product name and sample number and export data to SD-card • PSED: Permission to enter product name and sample number, export data to SD-card and delete log data • All: Full permission to edit and configure data logger
Sensor calibration	Permission to calibrate a sensor or to change calibration settings	• None: all calibration functions are blocked, verification can be done • Cal: Permisssion to perform calibration. All other menu points in „Sensor calibration“ menu are not accessible • Cal FlrWarnRst: Permission to perform calibration and to reset filter exchange warning • All: Permission to access all settings in „Sensor calibration“ menu
Date, time	Permission to set date, time	
Units	Permission to change units	
Acoustic and stable signals	Permission to configure acoustic singal menu	
Maintenance	Permission to access maintenance menu	• None: All maintenance functions not accessible • Imp.Conf: All maintenance function accessible except import of configuration • All: All maintenance functions are available
User Management	Permission to configure user management	• None: No permission to change user management settings • Admin Users: Permission to set-up and modify user accounts • Edit Profiles: Permission to set-up and modify permission profiles • All: Permission to access all functions of user management

11.4 Administration of User Accounts

User accounts can be adjusted or created by users respective permission

- Go to „System settings“ -> „User management“ -> „User accounts“
- The following options are available in the opening window:
  - Open an existing user account to modify it.
  - Create a new user account by hit [New user account]. The system verifies if user name is unique.
  - Delete an existing user account by pushing [Delete user account].

11.4.1 Adjustable Parameters within User Account Menu

Name	Description	Additional Info
Permission Profile	Allocation of Permisssion Profile to User Account by selecting the appropriate permission profile	• Permission Profile of the currently logged-in user cannot be changed. • If no permission profile has been allocated to a created user account, any permissions are granted to that user account.
Password	Define a password for the respective user account	• Protect each user account with a different password. • Do not set-up unprotected user accounts. • Select passwords which are difficult to find-out.

11.4.2 Check User Accounts

To receive a list of all user accounts and to verify if they are password-protected, please go to „System settings“ -> „User management“ and select „List user accounts“.
User accounts which are not password-protected are displayed in red color.

12. Additional Functions

The LabMaster-aw neo is equipped with many additional functions to ease instrument‘s use and handling. Some of the functions are not equally useful for each user.

12.1 Acoustic and Stable Signals

Various options are available to customize the stable signal appearance. it is also possible to connect an external optical or acoustic indication (flashing light,..)

12.1.1 Acoustic Signals

To change or modify the accoustic signal settings, go to „System settings“ -> „Acoustic and stable signals“. The following settings can be made:

- Volume key beep: Volume of beep if hitting a button
- Volume stability signal: Volume of beep once measurement has reached stability
- Duration Stability signal beep: Duration of beep signal once measurement has reached stability. If no value is entered, beep is switched off.
- Reminder stability signal beep: Time period, after which stable beep will be repeated. The repetition is done until beeper is switched off (confirmed) by a user or measurement chamber has been opened. An active reminder is displayed in the status bar as well. If „Duration stability signal beep“ is set to „Off“, this menu point is not displayed.

12.1.2 External Signal

If the LabMaster-aw neo is used in noisy environment, stable notification might not be recognized. Thereby, an optical or acoustic, external transducer can be connected to the instrument and be configured to provide a recognisable signal in such environment. The connector is a 230VAC socket
Once transducer is connected, go to „System settings“ -> „Acoustic and stable signals“ -> „External stable output“. The following settings can be done:

- Off: External signal is switched off
- During stable: External singal is switched on as long as stable signal is displayed
- During stability beep: External signal is switched on fro the time the stable signal beep is active on the instrument

12.2 Save and Load of Configuration (SD-Card)

Instrument specific data like profiles, sample database and other settings except calibration data can be exported to the SD-card. To do so, select „System settings“-> „Maintenance“->“Configuration (Export, Import)“.
The exported configuration is stored in the main directory of the SD-card as a XXXXXXX.cfg file whereas XXXXXXX represents the serial number of the instrument. By this labeling, it is possible to store configurations of different instruments on one SD-card.
Of course it is possible by this to transfer a once set configuration of one LabMaster-aw neo to other LabMaster-aw neo to create several instruments with exact same configuartion.
To protect the exportet files and to avoid that passwords can be read-out, files are AES-256 Bit encrypted.

12.2.1 Save Configuration

To export (or save) a configuration, simply proceed to „System settings“->

„Maintenance“->“Configuration (Export, Import)“ -> Export to SD-card“ and confirm prompting by [Yes]. If a configuration of the current instrument is already stored on the SD-card, file is overwritten.

12.2.2 Load Configuration

To import (or load) a configuration,

- Go to „System settings“-> „Maintenance“->“Configuration (Export, Import)“ -> Import from SD-card“ .
- Now choose the appropriate configuration. If any configuartion file is detected on the SD-card, an error message is displayed.
- Confirm question by [Yes] that configuration is loaded and existing configuration will be overwritten on the meter in following pop-up window.
- Confirm that system will be booted and new configuartion will be loaded

Note:

- If a configuration can not be loaded due to corrupt file or while created by a non-compatible software, system will load the last working version once boot process is performed. This reset will be notified by an issued error message after booting.
- It is possible that configuration created with a newer firmware are not working on instrument with previous firmware versions.
- The license code will not be overwritten once configuration is loaded.

12.3 Reset to Factory Settings

It can be necessary that a reset to factory settings need to be performed. This is done by selecting “System settings“ -> „Maintenance“ ->“Reset to factory settings“ -> „[Yes] -> „[No].

Please note the following:

- Calibration data and other data on the sensor remain
- Audit Trail remains as well and reset is recorded
- User management and Sample Database will be deleted
-

12.4 System Update

Novasina is offering system updates from time to time (not every month, maybe once a year or so). Those updates are free of charge.

Please contact your local Novasina distributor and ask about the latest LabMaster-aw neo update file. Unce received, please proceed as follows:

- Unzip the received file named update.zip.
- Copy unziped update file into main directory of the SD-card by using a PC
- Insert SD-Card into LabMaster-aw neo.
- Start update process by go to „System settings“ -> „Maintenance“ -> „System Update“ and press [OK].
- The update is performed automatically
  - First, master software is written into flash memory and system will be restarted.
  - Second, sub-systems (chamber control, humidity and IR sensor) will be updated.

Note:

System is designed in a way that further attempts of an update can be performed if current update fails (power outage, manual abort of update etc). By this, functionality can be brought back to instrument if a current update failed.

Important!

- SD-card must remain in the instrument until update process has been completed!
- Once update has been performed, „Firmware uploaded successfully“ message must appear. If not, repeat update process.

12.5 Brightness of Background Illumination

To change brightness of background illumiation, go to „System settings“ -> „Maintenance“ -> „Display settings“ -> „Backlight brightness“.

12.6 Select PC Interface

By default, USB interface is activated to connect then LabMaster-aw neo to a PC. If a connection by RS-232 is necessary, interface can be changed in „System ysettings“ -> „Maintenance“ -> „Interface for computer connection“.

12.7 Help System

The LabMaster-aw neo is equipped with an online help system, accessible on the instrument. Once help or further explanation to a menu point is needed, press the button with yellow circle and blue question mark in it. Help info will pop-up and provide further details about a specific option or menu point.

13. Maintenance

The following chapter describes the main maintenance task which can be performed by the user himself.

13.1 Cleaning of the Instrument

Just use a soft tissue and pure water to clean the instrument. If necessary use mild detergents in addition. NEVER use cleaners containing aggressive and/or oxidizing chemicals . Make sure the chamber is thoroughly dried after cleaning to avoid wet residuals and hence influence consecutive water activity measurements. If the outer parts need to be cleaned, be aware that some areas of the instrument are not sealed and water can enter. Best way is to use a wet tissue as well to remove dirt and dust.

Important!
Before cleaning, switch off the LabMaster-aw neo and disconnect it from the mains.

13.2 Cleaning the aw-measurement cell

Please do **NEVER** clean the sensor itself, neither the grey protection filter in front of it. The sensor is a very sensitive element with a protection filter on top. Every cleaning (touching, use of pressurized air, cleaning detergents, scratching etc.) will destroy the measuring sensor inevitably. Possible warranty claims expire instantly.

13.3 Cleaning the Infrared „IR“ sensor

Clean the IR sensor with a humid swab. Pay attention to not applying strong

forces on the window of the IR-sensor. A contaminated IR-sensor leads to longer measurement times but not to wrong measurements.

13.4 Periodic Verification and calibration with Humidity Standards

Like all precision measurement instruments, the LabMaster-aw neo must be checked periodically and if necessary recalibrated. Please head back to chapter 6 to learn more about verification and calibration . The Novasina SAL-T humidity standards are suitable for this procedure. If required, the standards can be provided with an certificate issued by international accredited lab.

13.5 Replacing Protective Filters

Always use at least the provided mechanical protection filter to protect the measuring sensor from contamination by overfilled sample cups. In addition, it might be necessary to use a chemical protection filter to protect sensor from volatile components. Various filters are available for different type of volatiles. Please consult the filter selection data sheet or contact your local Novasina agent if you need help.

As the filters are fixed by magnet, use the service tool which is located in the salt standard case to take exhausted filters away and mount fresh ones back.
Such chemical protection filters have to be replaced periodically due to the fact that they get saturated. As filters do not cover the IR-sensor, measurement time will not be elongated nor disturb the temperature measurement of the sample.

Novasina provides the following chemical protection filters for the LabMaster-aw neo:

eVC-18 filter:
Protects against short-chained organic acids as acetic and formic acid and other carboxylic acids (butyric acid etc) and oxidizing agents as hydrogen peroxide and chlorine and as well againts diluted sulfur dioxide.

eVC-18 / eVALC combination:
Protects against essential oil or other strong aroma. Works best with awSens-ELS.

Redox filter:
Protects against volatiles containing primary and secondary alcohols (attention, ethanol is an exception, gylcerin, glycols, PEG, perfumes, flavours etc.

In addition, the following sensors are available:

awSens-ENS
Standard sensor for most application except for measurement samples containing ethanol and/or essential oils

awSens-ELS
Special sensor, resilient against alcohol and certain polyalcohols. Must be used for samples containing alcohol and/or essential oils / strong aroma

13.6 How to Check Chemical Protection Filters for Saturation

All filters are apsorption-type, thus they will become saturated after some time and loose their functionality. It is of crucial importance to check the filter for saturation. Please proceed as follows:

- Select a SAL-T standard which has an aw-value close to the products which are normally measured with the instrument.
- If the calibration interval gets shorter (i.e. from 30 days to 20 days) at least two times in a row, replace the filter. The more frequent calibration is an indication for sensor contamination.
- Proceed with verification with tolerance +/- 0.005aw
- If verification fails, perform calibration an note date.
- By replacing the filter, you get an idea about the exchange internval (install date to exchange date) and you can define a standard filter exchange interval.

Important !
Defective or wrong mounted filters do not fullfil their function and provide the risk of instrument or sensor damage. Such filters must be replaced immediately.

13.7 How to Change a Measurement Sensor

If a measurement sensor is treated correctly (by using appropriate chemical filter protection if necessary), lifetime should be around 3-5 years.
If a sensor is defective or cannot be calibrated anymore, a replacement must be done.
Please procced as follows:

- Make sure you ahave a replacement sensor available. If not, contact your local Novasina agent to order one
- Switch off LabMaster-aw neo instrument and open measurement chamber
- Take the hexagonal wrench which is located in the salt standard case
- loosen and remove the 3 screw fixing the measurement head
- Pull at the black sealing to remove the measurement head and place it sensor-side downwards on the table:

- Remove the two small screws, pull out the old sensor and mount the new one
- Fix new sensor with the two small screws
- Mount sensor head back to the instrument and fix it with the 3 long screws
- Switch on instrument

novasina

The Art of Precision Measurement

Novasina AG
Neuheimstrasse 12
8853 Lachen
SWITZERLAND
Tel +41 55 642 67 67
info@novasina.ch

www.novasina.ch