OUTGROWTH MICRO-ORGANISMS

SHELF LIFE

MEASURING AW-VALUE

WATER ACTIVITY

CRYSTALLIZATION, DISCOLORATION, ETC.

ISOTHERMS

PEDAK

measurement solutions

TABLE OF CONTENTS

WHAT YOU SHOULD KNOW
before measuring water activity (Aw-value)

Water Activity Measurement is used for quality control of

FOOD:
- Meat / Fish
- Bakery
- Cheese /Dairy
- Processed Food
- Chocolate / Candy / Sweets
- Pasta / Dried Products
- Pet Food

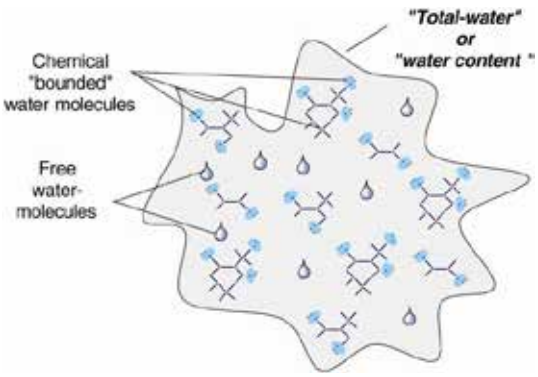
PHARMACEUTICAL:
- Tablets
- Powders
- Salts
- Chemicals

COSMETICS:
- Ointment
- Cream
- Paste
- Paint

What is the difference of the measurement parameter "total water" and "water activity"?

1 **The total water/moisture**
The moisture content is the total water in a product, including the molecularly bound water, and is expressed in % of the total weight.

2 **Water activity**
It means the relative product equilibrium humidity, the freely available water for micro organisms to grow. Its measuring value is called "water activity" (Aw-value) in a range of 0.03 - 1.000 Aw.



Moisture contact	Water activity
• Total water in a sample in % of the sample mass • Dependent on initial weight • Partially responsible for unwanted reactions and microbiological growth	• Free, available water in a sample • Independent on initial weight • Responsible for unwanted reactions and microbiological growth

Water is a **basic ingredient** in foods, pharmaceuticals and cosmetics.
Its control can be critical to guarantee microbial safety during shelf-life and consumption, or for optimising a production process.

Why to measure the "water activity"?

Water activity, pH, temperature, and other parameters, have a direct impact on the growth of micro organisms, thus aw and pH are two of the most important parameters.

Free water that is available to **molds, yeasts, and bacteria** is responsible for their growth and even toxin production. Or it may participate in chemical/biochemical reactions (eg. Maillard reactions), which might deteriorate:
- **texture, flavour**
- **colour**
- **taste**
- **nutritional value**

of a product, and its stability > shelf-life time.

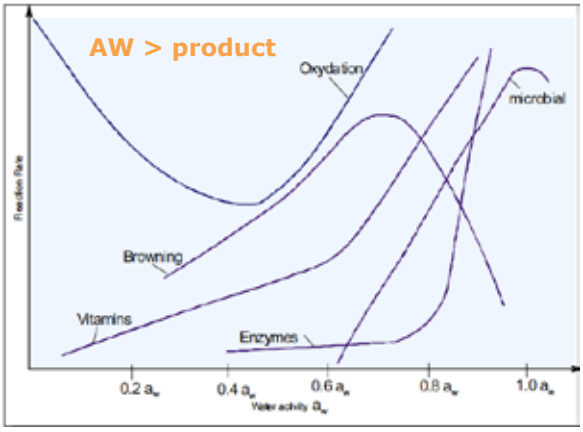
These are some of the main reasons why a correct measurement of the water activity aw is so important.

The importance of aw-measurement		
✓	Microbial safety	To predict shelf life
✓	HACCP requirements	As part of QC
✓	Fulfil government regulations	EU, USA, Japan, ...
✓	Control chemical reactions, physical proporties	To guarantee product quality, good taste, colour, crispness

The recognition of the importance of water activity started in Europe over 30 years ago and was then also incorporated into FDA and USDA regulations.
Today it is one of the critical parameters of the **HACCP** requirements.

Influence of the water activity on the product

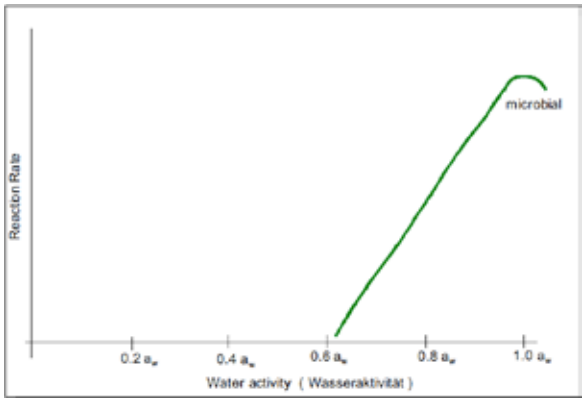
Water activity is jointly responsible for the growth of undesirable organisms such as bacteria or fungi, which produce "toxins" or other harmful substances. But also chemical/biochemical reactions (e.g. Maillard reaction) increasingly take place.



The following properties a of a product are affected:

- Mircrobiological stability
- Chemical stability
- Content of proteins and vitamins
- Colour, taste and nutritional value
- Stability and durability
- Solubility and texure

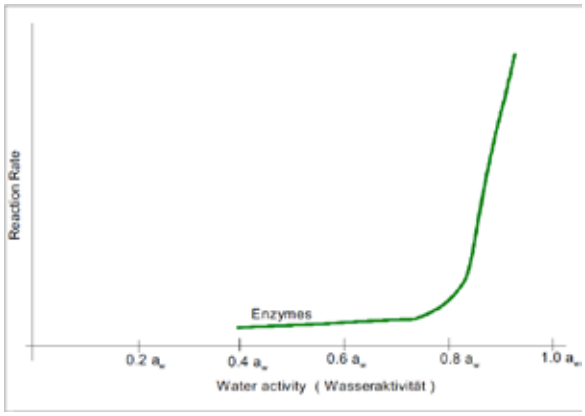
Microbial Growth



- Decreasing quickly with declining aw-value.
- There is no more microbial growth under 0.6aw!

Enzyme Activity

- For various enzymes a minimal water content is necessary
- It leads to changes in nutritional value, colour and flavor
- Themost enzyme activity slows down below an aw-value of 0.8



Enzyme activity water effects:

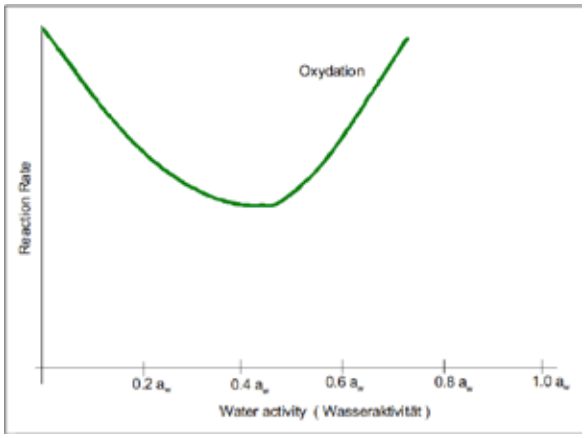
- Dissolve substrate
- Increase substrate mobility
- Water can be a reactant

Enzyme stability water influences:

- The denaturations:
  - Hydrolysis
  - Deamidation
  - Oxidation

Lipid Oxidation

- Oxidation is one of the major causes of food spoilage and it is initiated by metal ions.
- The reaction rate falls with a lower awvalue and increases again. The minimum is at 0.3 aw.



Causes of anti-oxitative effect (range 0 – 0.3 aw)

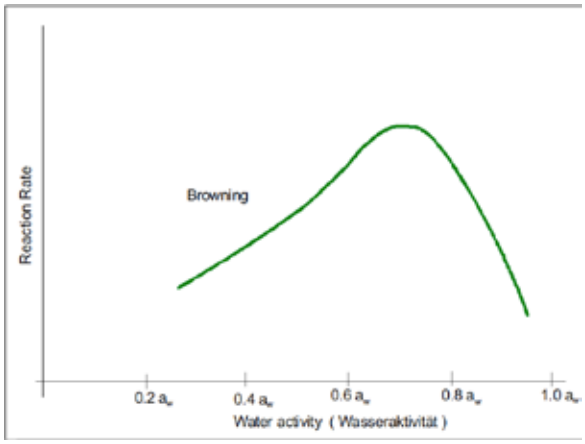
- Reduced oxygen diffusion
- Less available metal ions due to bonding with water molecules
- Free radicals are bounded

Causes of pro-oxidative effect (range 0.3 – 1 aw)

- Increased mobility of the reactants (metal ions and oxygen)
- Increased dissolution of catalysts
- The food swells what causes a surface extension

Non-enzymatic reactions

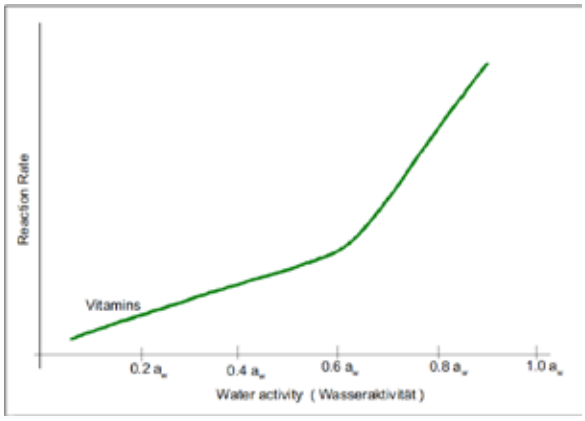
For non-enzymatic reactions you can mainly mention the protein denaturation and the non enzymatic browning. Mostly the nonenzymatic browning causes the most noticeable changes. The extent of browning reactions depends on the water content repectively the water activtiy of a product.



The probability of the non-enzymatic reaction is more probable with increased aw-value and reaches a: **Maximum at 0.6 – 0.7aw**

Nutrient Degradation

Vitamins are essential food components therefore its preservation during the processing of food is of prime importance.



The reaction rate of vitamins increases with increasing awvalue. This leads to degradation and loss of vitamins.

FOOD

For innumerous food spoilage organisms a minimum aw-value is known

Below this value its growth and toxin production is inhibited

Bacteria, for example:	minimum aw-value
Staphylococcus aureus: **Clostridium botulinum A and Escherichia coli** **Salmonella**	0.86 aw 0.95 aw 0.92 aw
Molds, for example:	minimum aw-value
Aspergillus flavus: produces toxin above 0.83aw, but does not grow below Fungi, other molds, mildew, yeasts go lower, but not beyond	 0.78 aw 0.60 aw

aw-range of food and its microflora

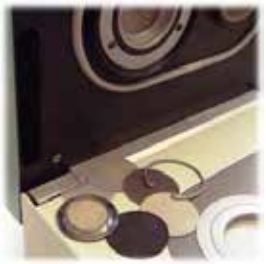
aw-RANGE	FOOD	MICROORGANISMS
0.80 - 0.60	Dried fruit Spicies Cereals Nuts	Xerophilic fungi (Aspergillus candidus, ...) Osmophilic yeasts
> 0.60	Confectionery Honey Noodles egg- and milk powder cookies, cracker, etc.	No microbial growth but may remain viable
0.92 – 0.87	Fermented sausages, Biscuits, cheese, margarine	Various yeasts (Candida, ...) Micrococcus
0.87 – 0.80	Fruit juice concentrate, Condensed milk, chocolate syrup, flour, fruit cake, ham	Most molds, Staphylococcus aureus, most Saccharomyces, Debaryomyces
> 0.98	Fresh meat Fresh fish Fresh fruits & vegetables	Pseudomonas, Escherichia, Proteus, Shigella, Bacillus, Clostridium perfringens
0.92 – 0.98	Sausages Cheese Bread	Salmonella, C. botulinum, Lactobacillus, Pediococcus, some yeasts and molds

Growth and sources of different bacterias

	MEAT	MILK	POULTRY	EGG	FISH	FRUITS & VEGE-TABLES
Salmonella	•	•	•	•		•
Pathogenic E. coli	•	•				•
Campylobacter		•	•			
Y. enterolytica	•		•			
C. perfringens	•		•			
C. botulinum	•				•	•
L. monocytogenes	•	•	•		•	•
Vibrio sp.					•	•
S. aureus	•	•	•			

Lowering the water activity is necessary to preserve food and guarantee shelf-life!

- Sun-drying, adding salt or sugar are practices known for centuries
- Dehydration/freezing or drying are modern techniques
- Humectants like honey or corn syrups (sugar), polyols (eg. glycerine, glycerol, propylene glycol, sorbitol), but also proteins, amino acids etc. are today commonly found in foods !
- A smart combination results in an optimum texture, flavour, taste, colour of the final product.



The measurement of products containing alcohol, aromas, aggressive volatiles with a Novasina instrument is easy: the direct aw measuring principle combined with a special filter produces reliable results.

PHARMACEUTICAL / COSMETIC

Pharmaceutical applications

Many well known companies all over the world measure the relative equilibrium humidity for decades already with Novasina instruments:

- powders
- tablets
- ointment

The main purpose to do > that is to optimize their production processes!

Powders are very dry, and their moisture content very low, sometimes too low for a highly accurate determination:

Example:
A product may have 0.1% moisture content, but its rh is as high as 15% rh (0.15aw). So it is much easier to measure the relative humidity.

Many pharmaceutical companies produce a large variety of products. The control of:

- physical
- chemical
- mechanical (eg. good flow)
- and perhaps microbial properties

is essential and therefore they invest in versatile universal aw instruments.

Such an instrument, covering the whole aw-and full temperature range, is the preferred choice!

aw-range **0.01...1.00 aw**
temperature control **0...+50°C**

TEMPERATURE

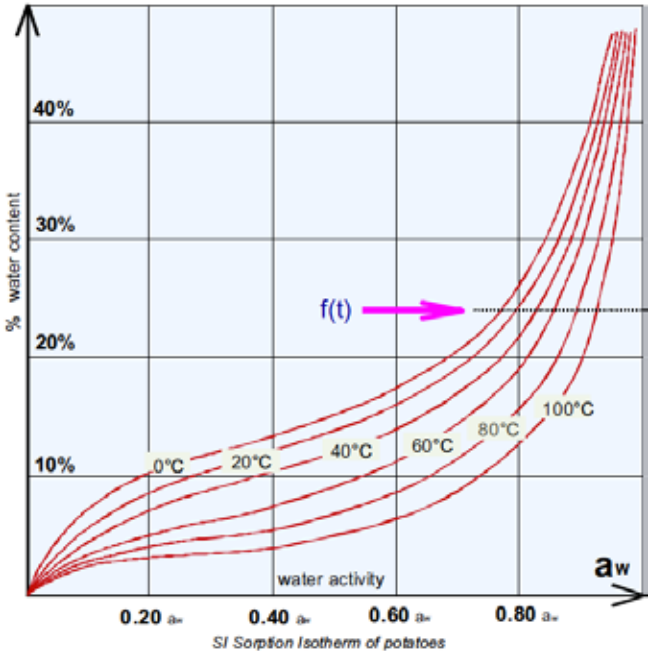
Why is the temperature control so important?

- There is NO reliable aw-measurement without temperature considerations!
- As higher the aw-value, the bigger the influence of temperature!

Example: Potatoes at different temperatures with constant moisture (always 25%)

Aw value at 0°C	= 0.76aw
Aw value at 20°C	= 0.80aw
Aw value at 40°C	= 0.83aw
Aw value at 60°C	= 0.85aw
Aw value at 80°C	= 0.90aw
Aw value at 100°C	= 0.93aw

Temperature effect



SI Sorption Isotherm of potatoes

Water activity changes with temperature thus:

- It is necessary to control temperature.
- Compensate for temperature difference between sample and sensor.

Purposes for temperature control:

- Aw-measurement at a defined temperature
- Lab to lab sample comparison
- Isotherm determination
- Compliance with government or internal regulations
- Eliminate extreme ambient temperature fluctuations

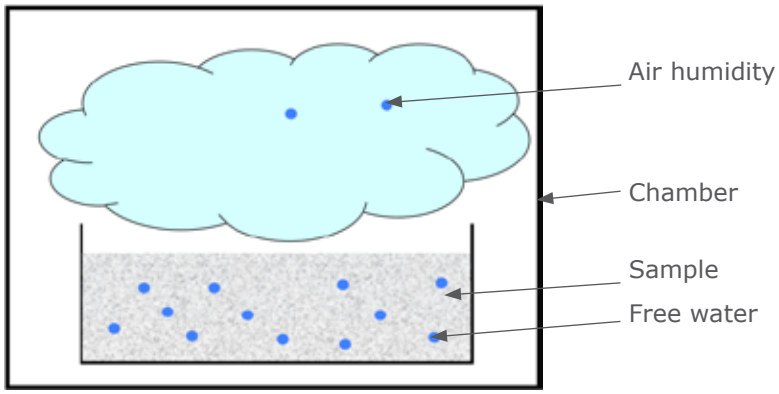
Water migration

- Two ingredients may have the same moisture content, but totally different aw-values.
- The water migrates from regions of high aw to regions of low aw, and not between areas of unequal moisture content!
- Water migration between different layers of a multicomponent food causes undesirable textural changes.
- This can be reduced by knowing and influencing the various levels of aw.

MEASURING PRINCIPLE

Measurement of water activity

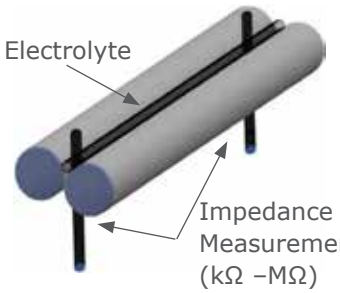
The test sample is placed in a completely sealed measuring chamber and the sample humidifies or dehumidifies the air volume inside the chamber till the equilibrium humidity is reached. This exchange takes place due to the partial water vapour pressure difference between the sample and the air.



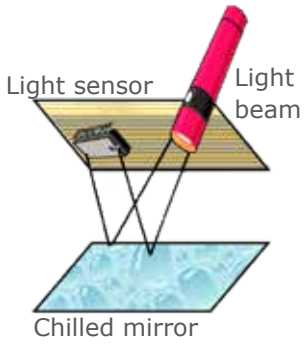
The measuring speed is largely dependent on the sample properties.

How to measure aw and rh in air?

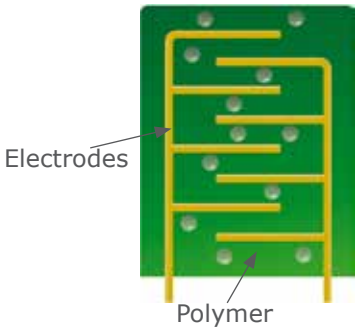
Resistive Electrolyte cell



Dew point mirror

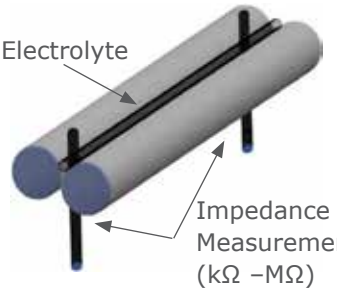


Capacitive measurement



FUNCTION	Liquide electrolyte changes resistance when the humidity around is changed	Optical identification of condensation on mirror temperature	Polymer expands with increasing humidity, thus changing capacitance
+	• Precision, reproducibility • Accuracy • No meas. hysteresis	• Precision • Speed	• Robust • Mass production (commodity)
-	• Limited temp. range (-20….+80°C) • Protection against chemical gases	• Costs • Cleaning • Service, maintenance • Interaction of chemical gases	• Hysteresis and irreversible condensation • Less accuracy spec. in high humidity range

Resistive Electrolyte Cell



Function:
Liquide electrolyte changes resistance when the humidity around is changed

- directly measuring the aw-value
- virtually hysteresis-free
- accurate to 0.003aw (0.3%rh), from below 0.03aw up to 1.00aw
- excellent repeatability of 0.002aw (0.2%rh)
- very easy and simple to change a calibrated measurement element (full accuracy)
- simple to calibrate the aw-system with saturated salt solutions

Saturated salt solutions

The saturated salt solutions can be used over many years as often as desired to verify and calibrate water activity instruments.

Advantages of saturated humidity standards:

- Simple handling
- Re-useable, good for 3-5 years if handled and stored correctly
- Simple control of lifetime

Sample preparation

A special sample preparation is not needed, but larger samples should be cut into small pieces: a volume of 8…15ml (ccm) is sufficient. Depending on the product, crushing or grinding may change the aw-value, so manually cutting and immediately testing is the safest procedure.

Multicomponent products may take a very long time to establish a final, common aw-value (several days, even weeks!), so it might be advisable to separate the different components and measure them individually.

AW-METERS FROM NOVASINA

novasina
The Art of Precision Measurement

LabMaster NEO

High precision water activity measurement

ADVANTAGES:

- ✔ Fully 21CFR11 compliant Audit Trail
- ✔ Automatic Verification & Calibration
- ✔ Re-usable salt standard with RFID tag for flawless identification & traceability
- ✔ Temperature Control : 0.0-60.0°C (32-140°F) aw : 0.0300-1.0000aw, resolution: 0.0001aw
- ✔ Various selectable stab-modes: Quick mode (finish max. 10 min) till Slow mode for max. accuracy & repeatability
- ✔ Fully 21CFR11 compliant user management including permission groups & user profiles
- ✔ Import/Export instrument Configuration on SD card
- ✔ Software included
- ✔ Datalogger with sample ID
- ✔ Robust closing

LabTouch

Smart water activity measurement device

ADVANTAGES:

- Easy accessible menus by large touch-screen
- Semi-temperature-stabilized measurement chamber
- Re-usable SAL-T humidity standards
- Long-life sensor for economy
- Fast and precise aw-measurement thanks to the worldwide unique “Novalyte” measurement technology
- Specific chemical sensor protection filters available
- Calibration data is stored on the sensor
- Data logging function with SD card
- Factory calibration at 7 aW-value points
- Checking, testing and adjusting possibilities
- (SAL-T humidity standards)
- Visualization and analysis software
- “Novalog MC”

The LabTouch-aw, with its ergonomic design and the touch-screen, makes water activity measurements easier than ever before. Semi-temperature-control and active sample temperature measurements, by an integrated infrared sensor, provide the highest possible reliability of measurements.

All measurement data, including the important protocols are stored on a SD card and can be transferred to a PC or printer. Special software is available for viewing results and analysis of the data. This assures confidence in readings for quality assurance and traceability of all measurement values.

In summary, the LabTouch-aw assures high measurement accuracy and reproducibility, long-term stability, ease of use and an economical measurement system. Get ready for the new standard for aw-value measurement.

LabSwift

Portable water activity measurement device

ADVANTAGES:

- Easy accessible menus by large touch screen
- Fast and precise aW-measurement thanks to the worldwide unique “Novalyte” measurement technology
- Highest reliability and long term stability
- Easy handling and intuitive menu structure
- Ergonomic housing design
- Portable, handy and long life battery powered
- Large LCD - Display
- Data logging function with SD card
- Factory calibration at 6 aW-value points
- Checking, testing and adjusting possibilities (SAL-T humidity standards)
- Widely maintenance free / simple cleaning
- Outstanding cost-performance ratio
- Standardised sample volume

Novasina is proud to present the newest product for water activity measurement. Never before the water activity measurement was so simple and fast. The latest sensor and measurement technology together with an intuitive and simple handling allows the measurement of the important qualitiy parameter “aw-value”.

The LabSwift-aw with its ergonomic design offers the possibility for portable measurements thanks to the optional lithium-ion battery. All data of a measurement, including the desired protocols are stored on a SD card and can be transferred to a PC or printer. A special program is available for the analysis of these data. The evaluation can also be done by a spreadsheet with Excel. This assures the full quality assurance and traceability of all measurement data.

The LabSwift-aw impresses with speed, high measurement accuracy, reproducibility and robustness. Consequently this system sets new standards for the portable aw-value measurement.

TECHNICAL SPECIFICATIONS OF:

- AW-METERS
- DATA LOGGERS
- WIRELESS HANDHELD THERMOMETERS
- WIRELESS REGISTRATION

AW METERS (water activity)

Water activity

LabMaster NEO and LabTouch

The water activity (Aw value) is a standard for the free water in a product. This allows to determine the microbial growth in foods. Besides application in the food industry, the Aw value is also important in the pharmaceutical and cosmetic industries. Aw meters from the Swiss Novasina provide, thanks to the unique measuring principle of the electrolytic cell, the most accurate aw-value determination. Both dry powders as well as wet foods such as meats can be measured without any problems. Also the measurement of products with volatile vapors is not any problem. For maintenance reusable calibration salts are used that allow the user to calibrate and align it oneself.

All Novasina meters are supplied with sample containers, calibration salts, calibration certificate and user manual.

Overview:

AW-METERS	
TYPE	**LabMaster NEO**
Features	
Aw Range	Extremely large measuring range (0.0300 to 1.0000 Aw) High accuracy of 0.003 Aw Integrated air-conditioned chamber (0 .. 50°C) Graphic display of measurement Delivery includes software
Aw Range	0,0300..1,0000Aw
Temperature range	0…60.00°C (32…140°F)
Accuracy Aw	+/-0.0030aw within cal. range
Accuracy temperature	+/-0.1°C
Reproducibility Aw	+/-0.0010aw within cal. range
Display	7'' capacitive touch screen
Measuring chamber	20ml
Calibration	10 point calibration with reusable tablets
Supply	100…260 VAC
Outputs	USB 2.0, RS232, SD-card
Applications	Laboratories Test Factories Production R&D

AW METERS (water activity)

AW-METERS	
MODEL	**LabTouch-aw**
Type	
Features	Extremely large measuring range (0.03 to 1.000 Aw) High accuracy of 0.005 Aw Integrated air-conditioned chamber (ambient to 45 ° C) Graphic color display with display of the measurement table Expandable with additional (not air-conditioned) measuring chambers
Aw Range	0,03..1,000Aw
Temperature range	15..35°C
Accuracy Aw	0,005Aw
Accuracy temperature	0,15°C
Reproducibility Aw	0,002Aw
Display	Graphic color screen
Measuring chamber	20ml
Calibration	7 point calibration with reusable tablets
Supply	230VAC
Outputs	SD-card
Applications	Laboratories Test Factories Production R&D

AW-METERS		
MODEL	**LabSwift-aw**	**Climmate**
Type		
Features	Compact (optional battery powered) Aw-meter Easy to use and maintain	Mobile battery powered Aw meter Penetration probe for big-bags and other bulk
Aw Range	0,030..0,950Aw	0,03-1,000Aw
Temperature range	5..45°C	5..45°C
Accuracy Aw	0,01Aw	0,01Aw
Accuracy temperature	0,15°C	0,1°C
Reproducibility Aw	0,002Aw	0,002Aw
Display	Numeric display	Numeric display
Measuring chamber	20ml	-
Calibration	5 point calibration with reusable tablets	Calibration 5 point calibration with reusable tablets
Supply	230VAC or battery	Battery or adapter
Outputs	SD-kaart	-
Applications	Laboratories Test Factories Controllers	Incoming controles Production

ACCESSOIRIES + OPTIONS
SD memorycard
Novalog MC visualisation for PC
Replacement sensor CM-2
Power supply universal
Protection filter REDOX
Protection filter eVC-21
Protection filter eVC-26
Protection filter eVALC
Pre-filter white 5 pieces
Tension ring
ePW sample dishes 100 pieces

HUMIDITY/AW STANDARDS
Humidity Check SAL-T 4% RV
Humidity Check SAL-T 6% RV
Humidity Check SAL-T 11% RV
Humidity Check SAL-T 23% RV
Humidity Check SAL-T 33% RV
Humidity Check SAL-T 43% RV
Humidity Check SAL-T 58% RV
Humidity Check SAL-T 75% RV
Humidity Check SAL-T 84% RV
Humidity Check SAL-T 97% RV

AW METERS (water activity)

Is it really necessary to have different water activity meters?

Every sample has its own characteristics in terms of ingredients, texture, color and taste. These in- turn influence the free water and finally the water activity each in a different way. These factors, plus the temperature influence, define the measurement time and the accuracy of the tests. Stable measurement conditions are finally the key to a successful quality control.

Novasina offers four types of water activity meters, carefully developed and designed, offering the most suitable solution to customers' samples and requirements:

- **LabMaster NEO-aw**: Top- of- the- range instrument with full temperature-controlled chamber. It can handle all types of samples from 0.0300 to 1.0000aw. Measurement accuracy +/- 0.003 aW.
- **LabTouch-aw**: Semi-temperature controlled measurement chamber, optimized for the measurement of aw values in the range of 0.60 to 0.90aw. Measurement accuracy +/- 0.005 aW.
- **LabSwift-aw**: portable aw-meter with no sample temperature control, thus environmental (lab) temperature is the measurement temperature. Suitable for low to medium aw-measurement in ranges of 0.11 to 0.60aw. Measurement accuracy +/- 0.01 aW.
- **LabStart-aw**: portable aw-meter with no sample temperature control, thus environmental (lab) temperature is the measurement temperature. Suitable for low to medium aw-measurement in ranges of 0.11 to 0.6aw. Measurement accuracy +/- 0.03 aW.




AW-METERS				
MAESUREMENT:	**LabMaster NEO**	**LabTouch**	**LabSwift**	**LabStart**
Lean Meat (fresh, dried, processed)	√	√	x	x
Fatty meat (sausages etc) (fresh, dried, processed)	√	x	x	x
Bakery products with fillings as jam, chocolate etc	√	√	x	x
Bread and bread products	√	√	√	√
Cereals	√	√	√	√
Fish	√	x	x	x
Chocolate incl. fillings, & confectionary	√	√	x	x
Powder, spices and dried products	√	√	√	√
Milk powder, dry dairy products	√	√	√	x
Yogurt, cheese, processed milk	√	x	x	x
Pet food	√	√	x	x
Pharma products (API,..)	√	x	x	x
Hygiene products (emulsion, creams,..)	√	x	x	x
Advice range aw	0.0300 - 1.0000 aw	0.06 - 0.97 aw	0.11 - 0.90 aw	0.20 - 0.80 aw
Range instrument	0.0300 - 1.0000 aw	0.03 - 1.00 aw	0.03 - 1.00 aw	0.03 - 1.00 aw
Range temperature	0…50°C	15…35°C	5…45°C	15…30°C
Accuracy aw	±0.003 aw	±0.005 aw	±0.01 aw	±0.03 aw
Accuracy temperature	±0.1°C	±0.15°C	±0.15°C	±0.15°C
Climate chamber	Yes, warming and cooling	Yes, warming	no	no
Possible filters	EVC-21, EVC-26, EVAL-C, Redox, Evmt-2, Evms-2	EVC-21, EVC-26, EVAL-C, Redox	EVC-21, , EVC-26, EVAL-C	EVC-21, EVC-26, EVAL-C, Redox
DELIVERY:				
EPW-cups	40	40	40	20
Humidity standards	11, 33, 58, 75, 84, 97	33, 58, 75, 84	11, 58, 84	75
Net adapter	na	1	1	1
230 VAC cable	1	net adapter	net adapter	net adapter
Front filters	na	5	5	5
Clamping ring	na	1	1	1
SD-card	1	1	1	na

Protective Accessories for humidity sensors

Dia. 35mm

Cell protection filters
LabMaster NEO-aw, LabPartner-aw, AW LAB Set H, ms1 Set aw, AW Center, AW SPRINT

General recommendation for:

Acids	**eVC-21**
Oil, fine dust	**eVC-26**
Alcohols	**Redox, eVALC**

These specially designed filters shall be used to provide protection against chemical perturbation. Mineral acids, halogens, powerful oxidizing agents and corrosive substances may damage the cells and reduce their lifetime. Chemical filters shall be replaced, when a recalibration of the cell becomes necessary more often, when replacing a cell, but latest after one year. The eVALC needs not to be replaced, if not mechanically damaged.The higher the concentration of an aggressive substance, the less effective will be the protection capability of a chemical filter, so the cell lifetime still can be reduced. If the concentration exceeds certain limits, no protection is guaranteed.

Only practical testing can answer the question about exchange cycles of a filter.

eVC-21 Chemical Filter

acetic acid (eg. mustard)	Essigsäure (zB. Senf)	(CH_3COOH)
formic acid	Ameisensäure	($HCOOH$)
butyric acid	Buttersäure	(CH_3-$(CH_2)_2COOH$)
lactic acid	Milchsäure	(CH_3 $CHOH$ $COOH$)
sulphuric acid	Schwefelsäure	(H_2SO_4)
sulfur dioxide	Schwefeldioxid	(SO_2)
hydrogen sulfide	Schwefelwasserstoff	(H_2S)
chlorine	Chlor	(Cl_2)
carboxylic acids,	aliphatic Carbonsäuren, aliphatische	(RCH_2CO_2H)
hydrogen halides	Halogenwasserstoffe	(HCl, HBr, HJ, HF)
hydrogen peroxide	Wasserstoffperoxid	(H_2O_2)
formaldehyde	Formaldehyd	($HCHO$)
jodine	Jod	(J_2)
chlorine, hypochloric acid	Chlor, hypochlorige Säure	(Cl_2, $HOCl$)

AW METERS (water activity)

Novasina FILTER SYSTEMS

eVC-26 Dust filter

oil fog	Oelnebel	
fine dusts	Feinstaub	
amines	Amine	
ozone	Ozon	(O_3)
nicotine	Nikotin	
aromatic hydrocarbons arom.	Kohlenwasserstoffe	(Benzol, Kerosen, Toluol)
perchlor-, trichlor-ethylene	Perchlor-, Trichlorethylen	(C_2HCl_3)
chloroform	Chloroform	($CHCl_3$)
nitrogen oxides	Stickoxyde	(NO_x)

Redoxfilter

primary, secondary alcohols	primäre, sekundäre Alkohole	(RCH_2OH, R_2CHOH)
glycerol	Glycerin	[CH_2(-OH)-CHOH- CH_2(-OH)]
ethanol (ethyl alcohol)	Ethanol	(C_2H_5OH)
isopropanol (isopropyl alcohol)	Isopropanol	[$(CH_3)_2CHOH$]
propanol (propyl alcohol)	Propanol	(C_3H_7OH)
propylen-glycol	Propylen-Glykol	(CH_3 CHOH CH_2OH)
polyethylen-glycol	Poly-Ethylen-Glycol	(PEG)
methanol	Methanol	(CH_3OH)
phenol	Phenol	(C_6H_5OH)
yeast and hop aromas	Hefe-, Hopfenaromen	
coffee aromas	Kaffeearomen	
artificial fruit aromas	künstliche Fruchtaromen	
onions, garlic, horseraddish	Zwiebeln, Knoblauch, Meerrettich	
furanes (bread aromas)	Furane (Brotaromen)	
ketones (eg. acetone or MEK)	Ketone (zB. Aceton od. MEK)	{$(CH_3)_2CO$, $(CH_3)CO(C_2H_5)$}
partly *amines*	teilweise *Amine*	(NH_2R, NHR_2, NR_3)
perfumes, flavours, fragrances	Parfüms, Duftstoffe	

eVALC Filter

for samples with little alcohol only / für Proben mit nur wenig Alkohol.

DATA LOGGERS

Data loggers are used to record measurements over time. The data loggers are equipped with an internal memory, battery and have internal or external sensors. Using a PC, the time interval, start and stop time, and the basic variables can be set. Afterwards, the data logger can be read via the PC and can conduct both graphical and tabular views.

Some applications: monitoring of temperature during the transport of food, climate measurement in archives, museums, offices, refrigerators, etc.

Overview:




COMPACTE LOGGERS				
MODEL	**U-serie**			
Type	**UX100-001**	**UX120-006M**	**MX1101**	**MX1102**
Eigenschappen	Eenvoudige bediening Uitgebreide software USB interface Programmeerbaar Export naar Excel mogelijk	Eenvoudige bediening Uitgebreide software USB interface Programmeerbaar Export naar Excel mogelijk	Eenvoudige bediening via de gratis App's Programmeerbaar via Bluetooth Export naar Excel mogelijk	Eenvoudige bediening via de gratis App USB interface Programmeerbaar via Bluetooth Export naar Excel mogelijk
Functie	Temperatuur (intern)	4x externe sensor aansluiting	Temperatuur (intern) Luchtvocht (intern)	Temperatuur (intern) Luchtvocht (intern) CO2 (intern)
Meetbereik	-20°C..70°C	0..2,5V; 4..20mA; temperatuur-sensoren CO2; zie accessoires	-20° tot 70°C 1% tot 95%	0° tot 50°C 1% tot 90% 0 tot 5000 ppm
Nauwkeurigheid	+/- 0,21°C (0°C - 5°C)	+/- 2,5%	+/- 0.2°C en +/- 2%RV	+/- 0.2°C en +/- 2%RV ±50 ppm ±5% van de uitlezing
Resolutie	12 bit	12 bit		
Geheugen capaciteit	128kb (84.650 meting)	4mb (1,9 miljoen)	84.000 metingen	84.650 metingen
Meet interval	1 seconde tot 18 uur, instelbaar	1 seconde tot 18 uur, instelbaar	1 seconde tot 18 uur, instelbaar	2 seconde tot 18 uur, instelbaar
Display	ja	ja	ja, ook uitschakelbaar	ja, ook uitschakelbaar
Afmeting	3,66 x 5,94 x 1,52 cm	10,8 x 5,41 x 2,54 cm	3.66 x 8.48 x 2.29 cm	4.75 x 12.50 x 7.45 cm
Batterij	3V knoopcel	2x AAA	2x AAA	4x AAA
Toepassingen	HVAC, HACCP Service Onderhoud	HVAC, HACCP Sevice Onderhoud	HVAC, HACCP Service, onderhoud, scholen, kantoren.	HVAC, HACCP Service, onderhoud, scholen, kantoren.

DATA LOGGERS

COMPACTE LOGGERS		
MODEL	**U-serie**	
Type	**UX100-011**	**UX120-014M**
Eigenschappen	Eenvoudige bediening Uitgebreide software USB interface Programmeerbaar Export naar Excel mogelijk	Eenvoudige bediening Uitgebreide software USB interface Programmeerbaar Export naar Excel mogelijk
Functie	Temperatuur (intern) Relatieve Luchtvochtigheid (RV) (intern)	TC: J, K, T, E, R, S, B, N
Meetbereik	Temperatuur: -20°C..70°C RV 1%..95%	Afhankelijk van type TC CO2; zie accessoires
Nauwkeurigheid	Temperatuur: +/- 0,4°C RV: +/- 2,5%	+/- 0,4°C
Resolutie	12 bit	12 bit
Geheugen capaciteit	128kb (84,650 meeting)	4mb (1,9 miljoen)
Meet interval	1 seconde tot 18 uur, instelbaar	1 seconde tot 18 uur, instelbaar
Display	ja	ja
Afmeting	3,66 x 8,48 x 2,29 cm	10,8 x 5,41 x 2,54 cm
Batterij	3V knoopcel	2 x AAA
Toepassingen	HVAC, HACCP Service Onderhoud	HVAC, HACCP Service Onderhoud

COMPACTE LOGGERS	
MODEL	**U-serie**
Type	**UX90-006M**
Eigenschappen	Eenvoudige bediening Uitgebreide software USB interface Programmeerbaar Export naar Excel mogelijk
Functie	Licht aan/uit 2x externe ingang aanwezigheid
Meetbereik	>65 UX 124
Nauwkeurigheid	NVT
Resolutie	12 bit
Geheugen capaciteit	512kb (346,795 meting)
Meet interval	1 seconde tot 18 uur, instelbaar
Display	ja
Afmeting	3,66 x 8,48 x 2,87 cm
Batterij	3V knoopcel
Toepassingen	HVAC, HACCP Service Onderhoud

DATA LOGGERS

COMPACTE LOGGERS				
MODEL	**MX-serie**			
Type	**MX2301**	**MX2302**	**MX2303**	**MX2304**
Eigenschappen	Weatherproof housing Built-in T/RH sensors Wireless setup and download Bluetooth Data in real time with free HOBOmobile app Retrieve data in hard-to-reach locations	Weatherproof housing External T/RH sensor Wireless setup and download Bluetooth Data in real time with free HOBOmobile app Retrieve data in hard-to-reach locations	Weatherproof housing 2 external T sensors Wireless setup and download Bluetooth Data in real time with free HOBOmobile app Retrieve data in hard-to-reach locations	Weatherproof housing External T sensor Wireless setup and download Bluetooth Data in real time with free HOBOmobile app Retrieve data in hard-to-reach locations
Functie	Temperature (T) (internal) Relative Humidity (RH) (internal)	Temperature (T) (external) Relative Humidity (RH) (external)	2 x Temperature (T) (external)	Temperature (T) (external)
Meetbereik	T: -40°C…70°C RH: 0%...100%	T: -40°C…70°C RH: 0%...100%	T: -40°C…100°C	T: -40°C…100°C
Nauwkeurigheid	T: +/- 0,2°C RH: +/- 2,5%	T: +/- 0,2°C RH: +/- 2,5%	T: +/- 0,2°C	T: +/- 0,2°C
Geheugen capaciteit	84.650 measurements	84.650 measurements	84.650 measurements	84.650 measurements
Meet interval	1 second to 18 hours, ajustable	1 second to 18 hours, ajustable	1 second to 18 hours, ajustable	1 second to 18 hours, ajustable
Display	no	no	no	no
Afmeting	10,8 x 5,08 x 2,24 cm	10,8 x 5,08 x 2,24 cm External T/RH sensor diameter: 1,17 cm	10,8 x 5,08 x 2,24 cm External T sensor diameter: 0.53 cm	10,8 x 5,08 x 2,24 cm External T sensor diameter: 0.53 cm
Batterij	2/3 AA 3.6 Volt lithium, user replaceable	2/3 AA 3.6 Volt lithium, user replaceable	2/3 AA 3.6 Volt lithium, user replaceable	2/3 AA 3.6 Volt lithium, user replaceable
Toepassingen	Agricultural research Soil investigation Climate research	Agricultural research Soil investigation Climate research	Agricultural research Soil investigation Climate research	Agricultural research Soil investigation Climate research

COMPACTE LOGGERS			
MODEL	**MX-series**		
Type	**MX2201**	**MX2202**	**MX100**
Eigenschappen	Waterproof housing Waterproof till 30 meter Wireless setup and download Bluetooth Works with free HOBOmobile app User-replaceable battery	Waterproof housing Waterproof till 30 meter Wireless setup and download Bluetooth Works with free HOBOmobile app User-replaceable battery	Splashproof housing Wireless setup and download Bluetooth Works with free HOBOmobile app Visual alarms on the logger display Lifetime of 1 to 2 years
Functie	Temperature (T) (internal)	Temperature (T) (internal) Light (L) (internal)	Temperature (T) (internal)
Meetbereik	T: -20°C…70°C	T: -20°C…70°C L: 0...167.731 lux	T: -30°C…70°C
Nauwkeurigheid	T: +/- 0,2°C	T: +/- 0,2°C L: ±10% typical for direct sunlight	T: +/- 0,2°C
Resolutie	98.000 measurements	98.000 measurements	30.000 measurements
Geheugen capaciteit	1 second to 18 hours, ajustable	1 second to 18 hours, ajustable	1 second to 18 hours, ajustable
Meet interval	no	no	no
Display	3,35 x 5,64 x 1,6 cm	3,35 x 5,64 x 1,6 cm	6,9 x 4,5 x 1,1 cm
Afmeting	CR2032 3V lithium, user replaceable	CR2032 3V lithium, user replaceable	CR2450 3V lithium, not replaceable
Batterij	Agricultural research Liquids investigation Climate research	Agricultural research Liquids investigation Climate research	Transport Monitoring Climate research
Toepassingen	HVAC, HACCP Service, onderhoud, scholen, kantoren.	HVAC, HACCP Service Onderhoud	

DATA LOGGERS

COMPACT LOGGERS		
MODEL	**U-series**	
Type	**U12-15 / U12-15-002**	**UV-Minilog**
Features	Underwater use Temperature Stainless Steel Wide-range	18 months logging without recharging Expandable with various other sensors
Function	Internal temperature	Internal UV (UVA, UVB, UVC, UV index, UV broadband) Temperature sensor Humidity sensor Pressure sensor Acceleration sensor
Range	Temperature -40°C..125°C	1nW/cm2 ….. 10W/cm2 -10°C…58°C 0%...100% 0…2500 mbar abs. +/- 10G / +/- 2G sel.
Accuracy	+/- 0,22°C @ 25°C	+/- 0,1°C (5°..45°C) / +/-0,2°C (-10°…58°C) +/- 2% (10..85%) / +/-4% (85…95%) +/- 2,5mbar (750 - 1100 mbar abs.) +/- 0,15 g (25°C)
Resolution	12 bit	
Memory	43,000	> 2,000,000 parameters
Measurement interval	1 second to 18 hours, adjustable	1 second to 12 hours, adjustable
Display	no	no
Dimension	1,75 cm x 10,16 cm	5,3 cm x 3,6 cm x 2,75 cm
Battery	Irreplaceable	Lithium-polymer
Applications	Autoclave logger, Food industry, Pharmacy, Medical	UV processes (curing), Museum, Monitoring of people, nimals, plants Monitoring of sunlight

COMPACT LOGGERS		
MODEL	**U-series**	
Type	**UV-Quadrulog**	**UV-TOUCH**
Features	4-channel data logger with display	Precision UV radiometer, dosimeter and data logger with 4.3" TFT touchscreen
Function	Temperature, relative humidity, pressure and shock acceleration including logging Number of sensors: 1 ... 4	Touch screen Radiometer, dosimeter, data logger and controller in one. Trend View Number of sensors: 1 ... 2
Range	-10°C...58°C 0%...100% 0...2000 mbar abs. +/- 15G	Depending on the selected sensors
Accuracy	+/- 0,1°C (5°..45°C) / +/-0,2°C (-10°…58°C) +/- 2% (10..85%) / +/-4% (85…95%) +/- 2,5mbar (750 - 1100 mbar abs.) +/- 0,15 g (25°C)	Depending on the selected sensors
Resolution		
Memory	> 2,000,000 parameters	> 11,000,000 parameters
Measurement interval	1 second to 12 hours, adjustable	1 second to 12 hours, adjustable
Display		4,3" TFT
Dimension	7,8 cm x 6,2 cm x 3,8 cm	17,5 cm x 11,7 cm x 3,7 cm
Battery	Lithium-polymer	Internal battery capacity: 10 hours
Applications	UV processes (curing), Museum, Monitoring of people, nimals, plants Monitoring of sunlight	UV processes (curing), Museum, Monitoring of people, nimals, plants Monitoring of sunlight

HANDHELD DATALOGGERS

HAND HELD DATA LOGGER		
MODEL	**OVA**	
Type	**OVASENS**	**OVAHYGI**
Features	Easy-to-use Ovasense sensor handle makes temperature measuring quick and easy. The sensor handle wirelessly transmits the measurement results to Ova mobile app via Bluetooth® connection. The sensor handle is designed to use normal kitchen environment and continuous careful use. Each Ovasense sensor handle is individually calibrated and calibration certificates are available under Support pages. Ovasense operates with original batteries and normal operation for at least one year.	Ovahygi makes rapid ATP surface hygiene sampling a part of your daily routine of ensuring clean surfaces, high quality production and safety. ATP sampling surface hygiene and traceably recording the results has never been so quick, easy and economic. Ovahygi can be used as a stand-alone measuring instrument, but it really excels when used seamlessly together with Nokeval's Ova mobile app and Ovaport network service. This is a combination that makes professional ATP surface hygiene sampling, measuring, recording and reporting a streamlined and efficient process. Product highlights Very easy to operate Fast measurement cycle, results under 1 minute Uses Hygiena Ultrasnap swabs Direct result read-out Seamless integration with Ova mobile app via Bluetooth® Battery powered, up to 3 year battery-life Compact and rugged design Ensures reliable results by monitoring the device orientation and ambient temperature
Function	Temperature	ATP
Range	T: -50...+120°C	na
Accuracy	Pt100: ±0.5°C in range -30...100°C	na
Outputs	Bluetooth	Bluetooth
Display	na	orange, 7-segment LED
Battery	1.5 V AAA alkaline	1.5 V AA alkaline
Sensor type	Pt100, 80 mm	Hygiena UltraSnap™
Applications	Kitchen environment Food production	Surface hygiene monitoring on a daily basis Ensuring the effectiveness of cleaning procedures, rapid feedback Quality assurance
Batterij	3V knoopcel	2 x AAA
Toepassingen	HVAC, HACCP Service Onderhoud	HVAC, HACCP Service Onderhoud

MONITORING, ALARMERING EN REGISTRATIE

Altijd en overal inzicht in en rapportage van uw meetwaarden

Monitoring systemen zijn nodig voor:
Het meten, opnemen en registreren van variabelen zoals temperatuur en relatieve luchtvochtigheid met als doel:

- Processen binnen de organisatie te verbeteren
- Optimaliseren van energie en middelen
- Kunnen reageren op veranderingen, uitzonderingen en calamiteiten
- Productie- en productverliezen te minimaliseren
- Voldoet aan eisen HACCP

Real estate
and construction industries

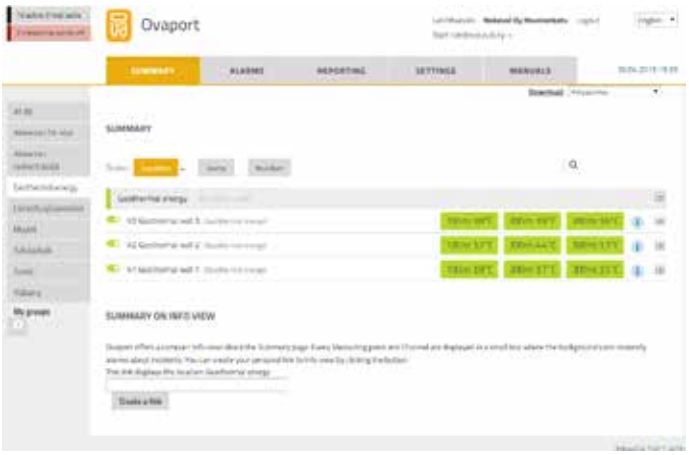
Kitchens

Environment and research

Industry

Pharmaceutics and laboratories

Transport



MONITORING, ALARMERING EN REGISTRATIE

Met onze systemen heeft u overal inzicht in alle meetwaarden.
Door middel van het Nokeval Ovaport Monitoring systeem kunt u:

- De geregistreerde actuele meetgegevens direct bekijken.
- Alarmen instellen zodat u bij te hoge en/of te lage temperatuur/luchtvochtigheid een alarm per SMS en of e-mail ontvangt.
- Met een druk op de knop een overzicht krijgen van alle gemeten waarden.
- De alarmen registreren.
- De historie bekijken.
- Zekerheid hebben dat er geen gegevens verloren gaan.
- Tijdsparen op tijdrovende temperatuur controles
- De kwaliteit van uw product verhogen dankzij een accurate metingen.

CALIBRATION AND MAINTENANCE

A technical service for your calibration and maintenance at our laboratory or at your location

Pedak measurement technique has its own technical department with many possibilities for calibration, service and maintenance regardless of the brand of your equipment. Based on more than 40 years of experience and a good cooperation with the manufacturers of the equipment, virtually all repairs are performed in-house.

The time you cannot use your equipment and the costs remain limited through minimum transport time is the walking speed. All calibrations are delivered with a traceable certificate. If possible and appropriate, the equipment is adjusted.

Calibration on location
To maintain your equipment even easier, you can choose calibration on location (for T, RH, dP, aw, pH and EC).

With this service it is possible to perform calibration at your location so you can save a lot of precious time and still retain maximum quality of your measurements.

Calibration services
- Humidity: these calibrations are performed with reference salts which have an accuracy of ± 0.3%
- Temperature
- Pressure
- PH
- Conductivity
- Wood and building moisture
- LUX / Light
- Gases: CO2 / O2 / CO / NH 3 / H 2 / LEL / VOC
- Weight
- Current / voltage / resistance
- Air velocity

Is your service not in the list?
Ask us about the possibilities!

ABOUT PEDAK

More than just meters...

From Antarctica to Africa. Measuring instruments of Pedak is all over the world. This is not surprising, because Pedak is the expert in measuring, recording and displaying. Pedak measurement is a supplier of measuring equipment. Dealerships of various brands from around the world provide a complete assortment consisting of:

• SENSORS	humidity, temperature, pressure, CO2, infrared, etc.
• DISPLAYS	panel meters, LCD, LED, cleanroom display, etc.
• DATALOGGERS	recording, alarm, display, wireless, etc.
• MONITORING	(wireless) measurement, register, visualization, alarm, enz.
• HAND METERS	from clamp ammeter to oxygen meter
• AW-METERS	water activity
• CALIBRATION AND MAINTENANCE	technical department and field calibration

Since 1975 Pedak supplies measurement solutions from The Netherlands. Due to the extensive experience and technical knowledge there have been a number of successful own developments introduced in (wireless) measurement, recording and displaying.

A complete list can be found on our website: www.pedak.nl

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