KIMO
INSTRUMENTS

KH 30

User manual

Kimo, a Sauermann brand.

$C \epsilon$ UK CA

KH 30   Compact Bluetooth logger for secure temperature and humidity recording.

Kimo Track   Smartphone application for monitoring KH 30 products.

Table of content

1. Quick start guide

Thank you for choosing a KH 30 product. For a quick installation, the following quick start guide is available:

- Install Kimo Track and connect to your KH 30

ⓘ More advanced operations such as setting up and starting a new record are detailed later in this manual.

1.1 Install Kimo Track and connect to your KH 30

1 Install the Kimo Track application

GET IT ON
Google Play

Download on the
App Store

2 Launch the application and connect your KH 30 module by scanning the QR code on the module

QR Scan

i In order to activate the Bluetooth features, the application asks for permissions when it first starts. It is necessary to accept all the authorizations for the application to work properly.

3 Congratulations! You have access to your KH 30! Take advantage of its many features

Access the history of the measurements recorded on the KH 30.

Locate your KH 30 by flashing it.

Share the history of measurements.

2.   Technology

2.1   Overview of the technology

KH 30 is a compact temperature and humidity data logger that can record regular data over long periods of time in a secure manner. It has a battery life of up to 8 years. The Bluetooth Low Energy communication allows to consult or retrieve the data with a smartphone and the application "Kimo Track".

Data recording

Sealed shell

Easy to attach

High precision temperature and humidity sensor

LED indication and identification

Integrated battery. Battery life up to 8 years
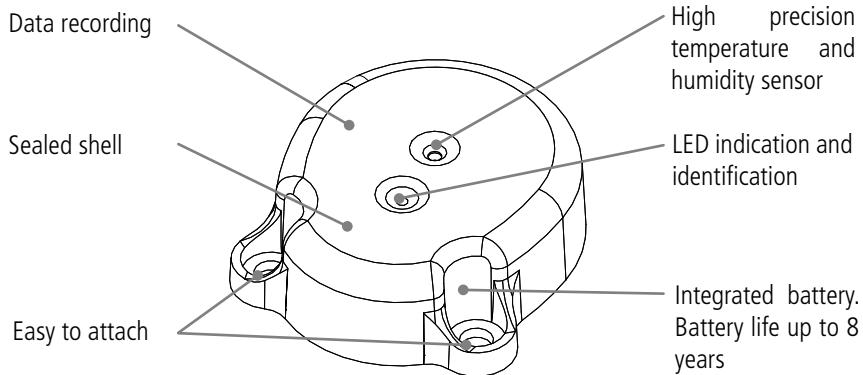
2.2   Use cases

KH 30 allows to monitor the environment, in case of storage or transport, of any material that may be sensitive to temperature and/or humidity. The data logging allows to know the history of the evolution of the environment in order to know if the material has been exposed to critical conditions.

The following is a non-exhaustive list of some frequently encountered uses of this sensor.

• Transport and storage of perishable goods (food, wine, etc.)
• Transport and storage of sensitive products (medical, biological, etc.)
• Transport and storage of precious objects (furniture, paintings, musical instruments, etc.)
• Wireless measurement in sealed containers (laboratories, R&D, etc.)

3.   Characteristics

3.1   Dimensions
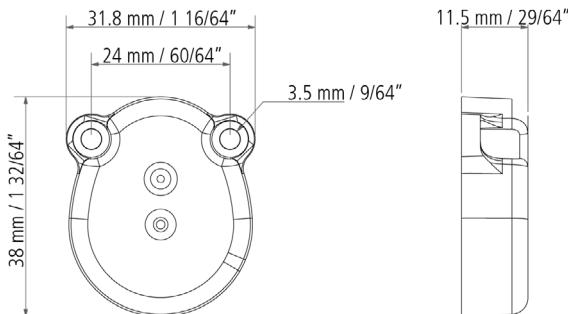
3.2   Lifetime

KH 30 has been optimized for low consumption. It includes a non-removable battery that gives it a life of up to 8 years depending on its use and the conditions in which it is used. Examples (applicable under standard conditions):

* Autonomy of 3.5 years with a measurement per second
* Autonomy of 8 years with a measurement every 10 seconds

More frequent measurements decrease the autonomy.

An active Bluetooth connection with a smartphone also increases KH 30's consumption and reduces its autonomy. Using KH 30 outside the indicated temperature ranges can significantly reduce its autonomy.

3.3   Memory

KH 30 uses a specific algorithm to compress the recorded data. The number of measurement points that can be stored in memory depends on the variations in humidity and temperature.

KH 30 can store a minimum of 172'000 humidity and temperature measurement points, i.e. a history of 120 days at a rate of one measurement per minute. For more details on the influence of the interval on the duration of the history, see point 4.4.1

Data compression is optimal if the variation between two measuring points remains between -0.20/+0.15 %RH and -0.35/+0.30 °C. The number of measurement points recorded can be up to 516,000 if the variations between two points remain within these ranges.

3.4   Measuring capacities and range of use KH 30

⚠️ Using KH 30 outside the indicated temperature range may alter its operation, cause irreversible damage and/or significantly reduce its life span.

Technical specifications

| Parameter	Humidity	Temperature
Range	0 to 100 %RH	-40 to 70 °C / -40 to 158 °F
Accuracy	Typ. ±2.0 %RH Max. ±4.5 %RH (10 %RH-90 %RH) Max. ±7.5 %RH (<10 %RH, >90 %RH)	Typ. ±0.2 °C / ±0.4 °F Max. ±0.4 °C / ±0.8 °F (0 °C - 65 °C / 32 °F - 149 °F) Max. ±1.0 °C / ±1.8 °F (<0 °C, >65 °C / <32 °F, >149 °F)
Resolution	0.06 %RH	0.09 °C / 0.09 °F
Drift	<0.25 %RH/year	<0.03 °C / <0.06 °C /year

General features

Battery	Button cell: CR2450 (non-replaceable)
Standards & Directives	2014/53/EU; EMV 2014/30/EU; RoHS 3; Reach
Protection	IP 68
Autonomy in standard conditions (with a 540 mAh battery)	3.5 years with 1 measurement per second 8 years with 1 measurement every 10 seconds
Recording capacity	Temperature on 11 bits, res. 0.09 °C / Humidity on 11 bits, res. 0.06%: Min. 172,000 temperature/humidity recordings. 120-day history with one measurement per minute.
Operating conditions (°C, °F / %RH / m, yd / MPa / bar)	-40 to 70 °C / -40 to 158 °F Working pressure (experimental laboratory tests): Working altitude: 0 to +2000 m / 0 to +2188 yd Working absolute pressure: 0.05 MPa to 2 MPa (20 Bar) Typical RH error, with absolute air pressure: 0.05 MPa to 0.3 MPa (3 bars): -0.35% /MPa (-0.035% /bar) 0.3 MPa to 2 MPa (20 bars): -0.49% /MPa (-0.049% /bar)
Storage temperature	-40 to 70 °C / -40 to 158 °F
Bluetooth	Frequency band: Bluetooth LE 2402MHz to 2480MHz ISM Band Maximum RF output power: < 4 dBm

ΔRH (%RH)
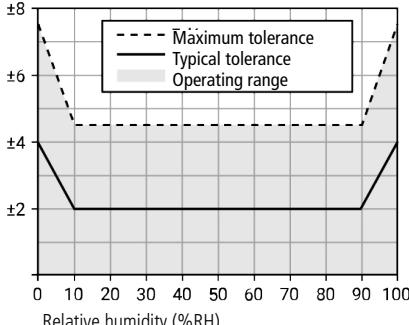
ΔT (°C)
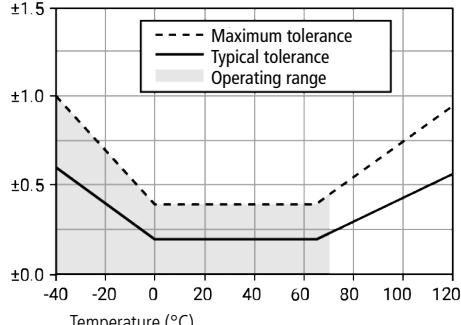
3.5 Bluetooth communication

KH 30 has a Bluetooth 5.0 Low Energy communication and is therefore compatible with all smartphones with this standard, using the application "Kimo Track". The maximum connection range is 10 meters / 32' without obstacles.

3.6 Labels

There are three labels per KH 30. The smallest (24x12 mm) is integrated in the module. The medium one (36x12 mm) is glued on the side of the packaging box. The large label (31x36 mm) is made available to the user for personal use.

ⓘ The labels contain a QR code with the KH 30 serial number. They facilitate the connection between the Kimo Track application and the KH 30 (see guide 1.1).

Module (24x12 mm)



Interior (31x36 mm)

Box (36x12 mm)

3.7 Packaging

The module is packed in a cardboard box with external dimensions of 14x40.5x35 mm, with KH 30 logo and a QR code referring to the product documentation.

The package contains:

- 1x KH 30 module
- 1x Sticker 31x36 mm with the serial number of the module

On the side of the box there is a label with the serial number of the corresponding KH 30 module.


14 mm

35 mm

40.5 mm
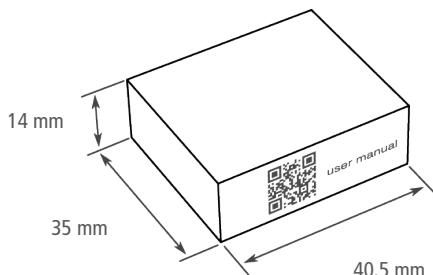
3.8   Installation

KH 30 should ideally be installed against a vertical wall or ceiling. It can be fixed with one or two screws (not included).

If the module is laid flat, dust can settle on the sensor over time and distort the measurements.

In any case, make sure that the opening at the temperature and humidity sensor is not covered.

Measurements will be inaccurate if the module is placed upside down or if the opening at the temperature and humidity sensor is not free.
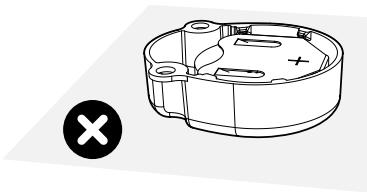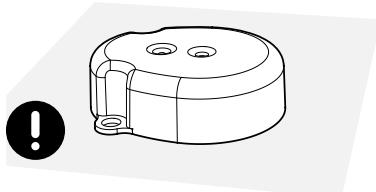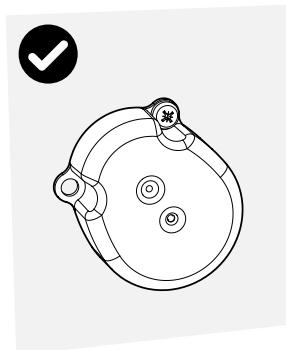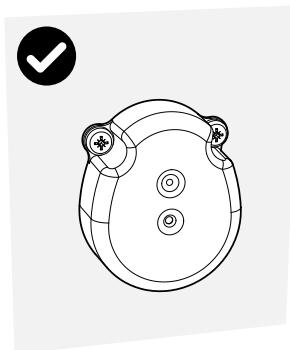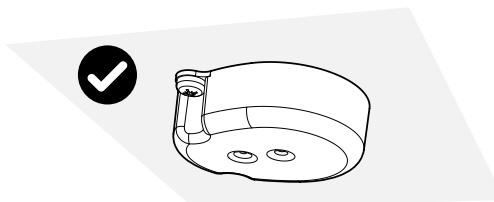
3.8.1 Usage Instructions and Limitations

Humidity and temperature sensors are highly accurate environmental sensors that require special care to ensure optimal performance. The sensors are susceptible to pollutants and must be protected from exposure to volatile chemicals, acids, bases, and cleaning agents. Especially Ketenes, Acetone, Ethanol, Isopropyl Alcohol, Toluene, etc., might cause drift, in some cases even irreversible. To ensure the sensors maintain their outstanding performance, it is important to follow these guidelines:

- Avoid exposing the sensor to pollutants, especially volatile chemicals such as solvents or organic compounds. High concentrations and long exposures should be avoided, as they can cause drift in the humidity reading or even irreversibly damage the sensor.
- Be aware that certain chemicals are often found in epoxies, glues, adhesives, and plastics, and may outgas during baking and curing, potentially affecting the sensor.
- Avoid exposure to acids and bases, as they can irreversibly damage the sensor. These include HCl H2SO4, HNO3, and NH3. High concentrations of ozone or H2O2 should also be avoided.
- Avoid contact with cleaning agents, such as PCB board wash after soldering, or strong air blasts from an air-pistol, as they can cause drift in the reading or complete breakdown of the sensor.
- Ensure good ventilation to avoid high concentrations of volatile chemicals, such as solvents, cleaning solutions, and detergents, e.g. ethanol, isopropanol, methanol, acetone, etc.

When packaging sensors, it is important to ensure that the materials used do not have the potential to cause sensor pollution. To maintain the accuracy and longevity of your sensors, only use packaging materials that do not outgas.

Metal-in antistatic shielded ESD bags, paper or cardboards based packaging, and deep-drawn plastic trays such as PE, PET, and PP may be considered. Do not use antistatic polyethylene bags, bubble foils, and foams, as they may contaminate the sensor. Additionally, be cautious when using stickers inside the packaging, as they can also cause contamination if not used properly. Sticker size should be kept to a minimum, and the sticky side should fully adhere to a surface.

It is important to note that many packaging materials may contain additives (plasticizers) that can have a polluting effect on the sensor. As a general rule, if a material emits a strong odour, it should not be used. Additionally, even materials that are recommended for use may contain additives, so it is important to be aware of this when selecting packaging materials.

4.   Kimo Track

4.1   Downloading and installation

The "Kimo Track" application is available for download on Google Play (Android) and App Store (iOS) at the following links :

https://play.google.com/store/apps/details?id=com.sauermann.kimotrack

https://apps.apple.com/fr/app/kimo-track/id6742738974

> ⓘ In order to activate the Bluetooth features, the app asks for permissions when it first starts up. It is necessary to accept all authorizations for the application to work properly.

4.2   Symbols

Symbols	Name	Description / Function
	Application info	Clicking on the icon opens a window with the application information (version, copyright, privacy policy).
	Access to local logs	Allows access to logs previously retrieved from KH 30 and stored locally on the smartphone.
NOM	Sorting by name	Allows you to sort the list by the local name of the KH 30.
RSSI	Sorting by RSSI	Allows you to sort the list by RSSI (Receive Signal Strength Indication), i.e. the strength of the BLE signal received by the application.
T°C	Sorting by temperature	Allows you to sort the list by temperature measured in degrees Celsius.
T°F	Sorting by temperature	Allows you to sort the list by temperature measured in degrees Fahrenheit.
%HR	Sorting by relative humidity percentage	Allows you to sort the list by relative humidity measured in percent.
	RSSI: Weak Signal	Symbolizes a weak Bluetooth signal (< -80 dBm).
	RSSI : Medium Signal	Symbolizes a medium Bluetooth signal (< -60 dBm).
	RSSI: Strong Signal	Symbolizes a strong Bluetooth signal (>= -60 dBm).
Scan	Bluetooth Scan	A click on the icon allows the discovery of KH 30 devices in the vicinity during 30 seconds.
QR Scan	Connection by QR code	Clicking on the icon starts the connection procedure by scanning the QR code.
	Battery full	The KH 30's charge reserve is full.
	Battery average	The KH 30's charge reserve is medium.
	Low battery	The KH 30's charge reserve is low.

Symbols	Name	Description / Function
	Logs	Clicking on the icon gives access to the logs in the KH 30's memory.
	Location	A click on the icon allows you to locate the KH 30 by making its red LED flash 3 times.
	Sharing	A click on the icon allows you to share the data in the KH 30's memory by email.
	Saving	Clicking on the icon allows you to save the data from the KH 30.
	Settings	A click on the icon allows you to access the KH 30 parameters.
Measures	Measurement parameters	Click on the icon to access the KH 30 measurement parameters.
	Alarm parameters	A click on the icon gives access to the KH 30 alarm parameters.
	Information parameters	Click on the icon to access the KH 30 information parameters.

4.3   Application pages

The Kimo Track application is divided into three groups of pages:

- The Home page allows you to search for KH 30 in your vicinity and to initiate a connection with a KH 30.
- The Device page allows you to view the status of the KH 30, the currently measured values and to view the history.
- The Parameters pages allow you to set up the KH 30, i.e. the parameters of the recording (measurement interval), its accesses etc.

4.3.1   Home Page

The Home page allows you to start searching for KH 30 in your vicinity and to initiate a connection with one of them.

Information about the application

List of nearby KH 30

View recordings stored on the smartphone

Pair the device through QR code scanning

Bluetooth scan to update the list of nearby KH 30
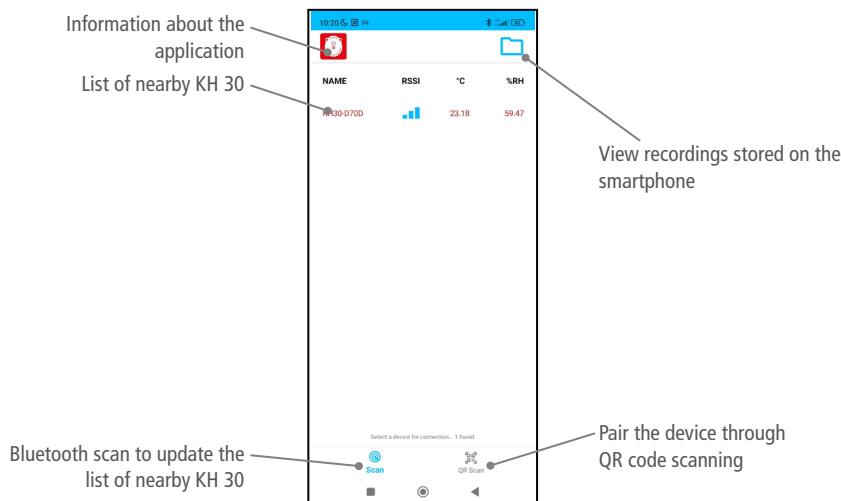
4.3.2   Device page

The device page allows you to view the current data record at a glance and to view the status of the current recording.

Local name of KH 30 —

Current temperature and humidity values

Parameters

Tolerances

Consult the history of the current measurements

Share the current recording

Locate the KH 30 by flashing it —
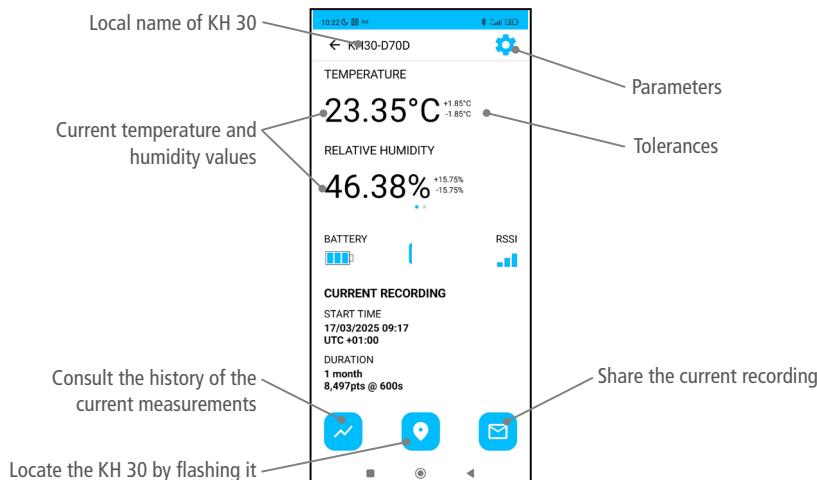
ⓘ The Kimo Track application only allows you to connect to one KH 30 at a time.

ⓘ The measurement tolerances are the typical tolerances. They depend on the absolute value of the measurement and the time (see points 3.4).

ⓘ A horizontal slide on the humidity displays the dew point (for details of dew point calculation, see p. 22).

ⓘ The share button allows you to download the data from the KH 30 memory and send them in .csv format by email.

4.3.3 Parameter pages

Measurement parameters

The "Measurements" parameter page allows you to start a new recording sequence.

Start a new recording

Selection of the time interval between two measurements

Selection of the behavior in case of KH 30 memory overflow

Information about the autonomy of the KH 30

Temperature unit preference (only for display in Kimo KH 30)
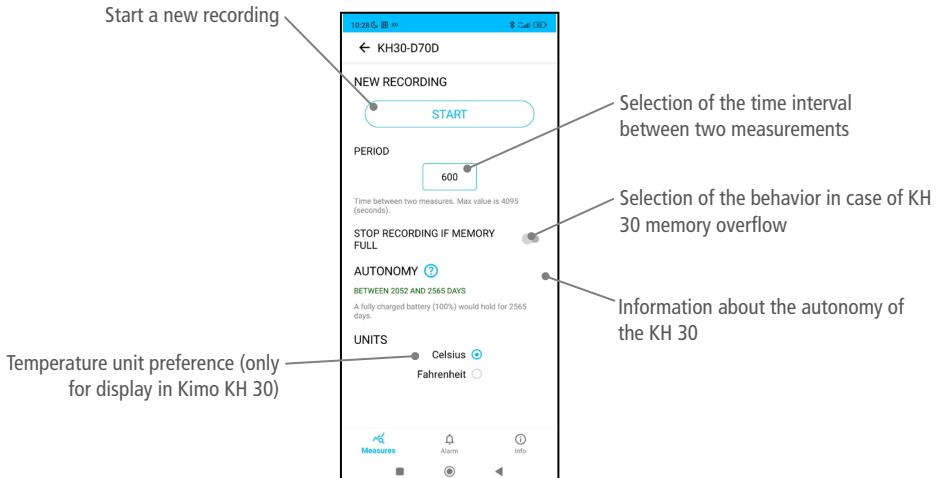
ⓘ Upon receipt of the devices, measurement points may be present. To start a new dataset with only new points: set the measurement settings and start a new recording.

ⓘ The measurement interval has an influence on the lifetime of the KH 30 and the time until the internal memory of the KH 30 is filled. See point 4.4.1

ⓘ The parameter "Stop recording if memory full" allows you to define the behavior of the KH 30 when the recording occupies the entire memory of the KH 30. See point 4.4.1

Alarm settings

The "Alarm" parameter page allows you to define or redefine upper and lower limits for temperature and humidityAlarm settingsAlarm settings. When a limit is exceeded, KH 30 goes into "alert" mode. The alert mode is characterized by the following behaviors:

• The KH 30 LED flashes twice every 5 seconds.
• The KH 30 and the temperature and humidity values are in red in the list of devices near the home page.
• The words Temperature and Relative Humidity are blinking in red in the Device page.

Lower temperature limit

Lower humidity limit

Upper temperature limit

Upper humidity limit

Save the new limits on the KH 30

Clear (reset) the current temperature alert

Clear (reset) the current humidity alert
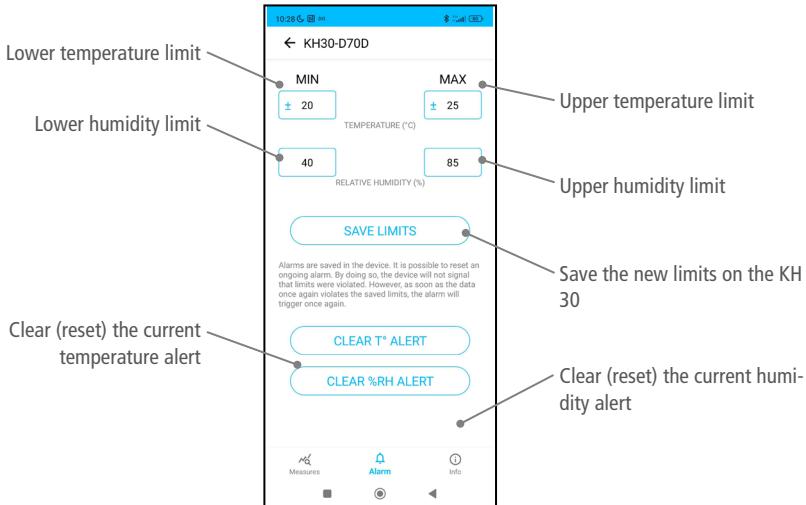
> **i** Setting the limits to their maximum values (-46°C, +128°C, 0%RH, 100%RH) disables the alarm system.

Information settings

The "Information" parameter page gathers the elements for identifying and updating KH 30.

Rename the KH 30

Serial number (identifier) of the KH 30

Kimo KH 30 application version

Firmware version of the KH 30

Update the firmware of the KH 30

Hardware version of the KH 30
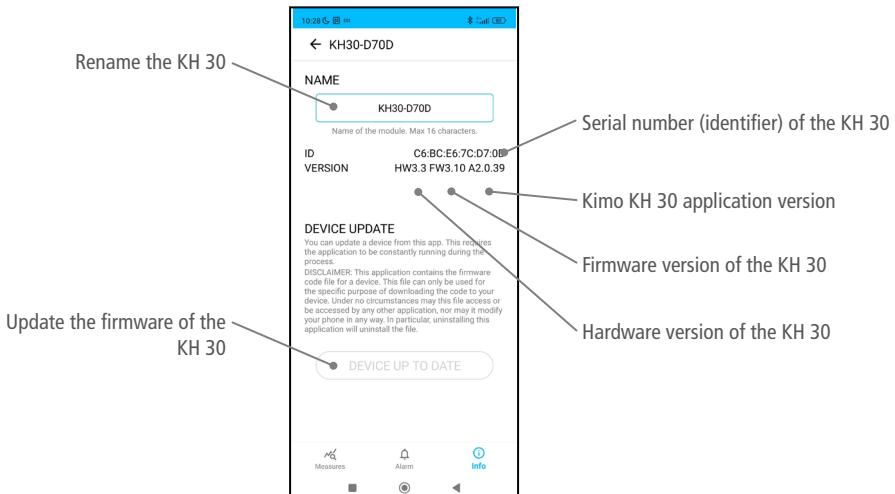
The KH 30 can be renamed and can contain up to 16 characters. If the name ends with groups of two sharps (##), these will be automatically replaced by the last values of the serial number. For example "KH 30####" becomes KH 30F8BC and "House ##" becomes "House BC".

If a new firmware version of KH 30 is available, it can be installed on KH 30 by clicking the "Update" button. Data from the current recording may be lost!

4.4   Features

4.4.1   Start a new recording

⚠️ When a new recording sequence starts, all the measurements stored on the KH 30 are no longer accessible.

When starting a new recording, it is possible to set the measurement interval and the behavior in case of full memory.

Measurement interval

It defines the time between two measurements in seconds. Although a small interval between two measurements allows a fine view of the history, it comes with some disadvantages:

	Small interval	Large interval
Time resolution	+	-
Lifetime (battery)	-	+
Duration of the history in autonomy	-	+
Time of collection and transfer of measurements	-	+

The KH 30 being in standby between each measurement, a small interval strongly decreases the global standby time and consequently increases the average consumption of the module.

The KH 30's memory being limited (172'000 points), it reaches saturation more quickly with a short interval. The duration of the history in autonomy (without the data being collected with the Kimo Track) is therefore lower with a small interval.

Representing the history of a period with a small interval considerably increases the amount of data to be processed and consequently increases download times, storage memory on the smartphone, etc. Examples:

Interval	1s	10s	1min	10min (default)
Lifetime	3.5 years	8 years	9 years	9 years
Duration of the history in autonomy	1 day and 21 hours	19 days and 21 hours	119 days	3 years and 98 days
Number of points after 1 year	31.5 millions	3.15 millions	525'600	52'560

Stop recording if memory full

This parameter allows you to define the behavior of KH 30 when the recording occupies the whole memory.

By default, the behavior when the memory is full is to overwrite the oldest measurements with the most recent measurements. The measurement history is therefore "sliding" with the passing of time and data cannot be collected further back than the duration of the KH 30's autonomous history.

When the "Stop recording if memory full" option is activated, KH 30 will simply stop recording measurements when the memory is full. This behavior preserves the measurements from the beginning of the recording and prevents them from being overwritten inadvertently.

KH 30 location

By pressing the location button, the connected KH 30 identifies itself by flashing its indicator LED three times. The LED is located on the top of the KH 30 under the white translucent shell.

The LED flashes three times

Dew point calculation

The dew point is calculated by the Kimo Track application from the current measured temperature and humidity values. The equation used is the following (approximation of Heinrich Gustav Magnus-Tetens):

With

$$T_{dp} = \frac{c \cdot \ln\left(\frac{HR}{100}\right) + \frac{b \cdot T}{c+T}}{b - \ln\left(\frac{HR}{100}\right) - \frac{b \cdot T}{c+T}}$$

T_{dp} Dew point [°C]

T Temperature [°C]

HR Relative Humidity [%]

b 17.62

c 243.12 [°C]

4.4.2 Sharing the recording by email

The data collected by KH 30 can be retrieved and sent by email for further processing and consultation.

Structure

When sharing the recording by email, a .csv file (comma-separated-values) is transmitted. The delimiter used is the semicolon ";" and the structure is composed of three data blocks:

Line 1: Recording info header
Line 2: Recording information

Line 3: Header of limits
Line 4: Limits

Line 5: Values header
Line >6 : Values

Example of the structure of the .csv file

Recording information

	1	2	3	4
1	Device Name	Timezone	First Timestamp	Last Timestamp
2	KH30F8BC	UTC+01:00	26.10.20022 10:10:00	28.10.20022 10:20:50

Limits

	1	2	3	4
3	Lower Temperature Limit (°C)	Upper Temperature Limit (°C)	Lower Humidity Limit (%RH)	Upper Humidity Limit (%RH)
4	12	19	20	30

Values

	1	2	3	4	5	6	7
5	ID	Imprecise time	Temperature Alert	Humidity Alert	Timestamp	Temperature (°C)	Humidity (%)
6	0	False	True	False	26.10.20022 10:10:00	27.55	25
7	1	False	True	False	26.10.20022 10:10:10	27.0	25
…	…	…	…	…	…	…	…

5.   Standards and safety

To ensure proper use of our technology, it is essential to observe the safety instructions given in this chapter. These recommendations are intended to prevent accidents, protect users and ensure the durability of the device. Please read them carefully and apply them systematically.

5.1   Safety

5.1.1   Children

KH 30 products must be kept out of the reach of children. Small items may constitute a choking hazard if swallowed. Please keep the product in a safe place when not in use.

Keep out of reach of children

5.1.2   Recycling

When disposing of the product, it is important to follow proper recycling practices. KH 30 products should either be returned to the supplier, or recycled in their entirety (without disassembly). They can be recycled together with household batteries or with smartphone or laptop-type accumulators and batteries. Collection points and recycling procedures vary according to the directives in force in the country concerned.

5.2   Materials and conception

KH 30 technology has been developed to guarantee waterproofness, vibration resistance, food compatibility and data integrity. As a result, the product cannot be disassembled, in compliance with the requirements of directives 2012/19/EU #21 and 2006/66/CE art. 11.

To minimize its ecological impact, it has been designed with reduced volume and weight, thus contributing to a smaller environmental footprint.

5.2.1   Batteries

KH 30 products incorporate a 3V CR2450 button cell with a capacity of approx. 500 mAh. Typical life is around 5 years, but can vary from 2 to 10 years depending on the configuration mode chosen.

5.2.2 Plastic and resin

KH 30 products are manufactured from carefully selected materials to guarantee robustness, durability and compliance with the requirements of various applications.

• KH 30 shell: Made from PBT (Polybutylene Terephthalate) plastic, specifically Celanex 2401/MT Natural grade.
• Resin molded into the shell: The product is made from a two-component Epoxy resin that complies with European food standards (EU) 10/2011 and 2020/1245.

5.3 IP68

KH 30 products comply with IP68 protection rating.

Id	Description
6	Totally protected against dust
8	Submersible equipment beyond 1 m

Contact address
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Suisse
Tel : + 41 21 632 60 10
Email: info@theye.ch
Web: theye.ch

The product is manufactured by FiveCo - distributed by Sauermann.
Le produit est fabriqué par FiveCo - distribué par Sauermann

Sauermann Industrie - ZA Bernard Moulinet - 24700 - Montpon-Ménestérol - France

Kimo, a Sauermann brand.

sauermanngroup.com

CE $\begin{smallmatrix} UK \\ CA \end{smallmatrix}$