



Manual for NB-xxx devices

NB-IoT devices communicate via the Narrow Band network only. Devices are delivered including a prepaid sim card.

Safety Notices

The device complies with regulations and standards in force in the Czech Republic and the European Union. The device has been tested and is supplied in working order. To keep the device in this condition, it is necessary to adhere to the following safety and maintenance instructions.

Using the device in a manner other than prescribed by the manufacturer may cause its safeguards to fail!

The power supply outlet or disconnection point must be freely accessible.

The device must not be used in particular under any of the following conditions:

- The device is noticeably damaged
- The device does not function properly
- Unfastened parts can move inside the device
- The device has been exposed to moisture or rain
- The device has been serviced by unauthorized personnel
- The power adapter or power supply cable are noticeably damaged
- If the device is used in a manner other than designed for, the protection provided by the device may fail.
- The local electrical system must include a power switch or a circuit breaker and overcurrent protection.

The manufacturer warrants the device only if it is powered by the supplied power adapter or an approved power supply.

If you have any problems with installing or operating the device, please contact the technical support:

HW group s.r.o.

<http://www.hw-group.com>

email: support@HWg.cz

Formanská 296

Prague, 149 00

Phone: +420 222 511 918

Before contacting technical support, please have at hand the exact type of your device (at the type plate) and, if known, the firmware version (see later in this manual).

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NB-xxx devices product family

NB-xxx Devices is a family of environment monitoring products using the Narrowband (NB-IoT) mobile network. All products feature robust design, battery-powered operation, and seamless integration with any portal based on the SensDesk technology. The HWg-cloud.com portal is for free, others can be paid services.

All devices include a 3V alkaline CR123A battery that allows continuous operation up to 3 years (depending on the device type, application and connected sensors).



NB-2x1Wire

A device for connecting thermometers, hygrometers, or other sensors via the RJ11 1-Wire (UNI) bus. Allows connecting several sensors to measure up to 4 quantities simultaneously.



NB-WLD

Water Leak Detection unit with 1 zone input (external WLD Type A moisture-sensing cable). One zone is max. 185 m (85 m / WLD sensing + 100 m / prolong cable).



NB-2xIn

A device for connecting external detectors via DI input (door or window contact, PIR motion detector or a smoke / gas detector with relay output). Allows connecting 2 independent detectors. Each DI input can feature pulse counters for connecting energy meters with SO output; however, external power is needed for reliable deployment.



NB-2xOut

A module with 2 DO (relay outputs) controlled from the portal (www.HWg-cloud.com or others) over the NB-IoT network.

Shared features of the NB-IoT product family

- Robust metal design, 67×78×33 mm (without antenna)
- External antenna, SMA connector
- 4FF (nano SIM) holder
- LED indicator
- Plug & Play – connect power or remove the insulating strip and the device is immediately available in the portal
- Device & communication settings (communication period, safe ranges) are configured in the portal
- Battery state appears in the portal as another sensor
- Powered from a 5V adapter or the built-in replaceable CR123A battery
- Default "subscribed" version of the device is delivered with 3-years prepaid simcard for Vodafone NB-IoT network.



Subscribed = 3 years subscription
NB-IoT SIM (Vodafone) included

For specifics of individual devices, including any differences in the measurement period, battery life and so on, see the respective device page.

Measurements and data upload

Measurement and data upload period

The period for logging the measured values and uploading them to the portal is fully configured automatically via the portal, separately for operation with an external power source and battery-powered operation. SensDesk.com portal default values:

External power

- Logging period (measuring, storing values in the internal memory): **5 minutes**
- Data upload period (connecting to the portal and uploading all logged values): **1 hour**
- Check period (NB-2xOUT brief query for output state changes): **10 minutes**

Battery power

- Logging period (measuring, storing values in the internal memory): **15 minutes**
- Data upload period (connecting to the portal and uploading all logged values): **10 hours**
- Check period (NB-2xOUT brief query for output state changes): **1 hour**

Only the Portal administrator may provides you other than automatic logging / Data update period settings (setupep per each device). Keep in mind device life time when powered from battery.

Data upload period cannot be shorter than 60 minutes and the Logging period shorter than 5 minutes.



Periodic and non-periodic reading of sensors

Sensors values are regularly read in the fixed Log Period, which is configured via the portal. However, in addition to the periodic reading, the values can be also read if the following happens:

- 1) The device is powered up by connecting the battery or an external power supply
- 2) The button is pressed
- 3) If the SafeRange is exceeded at the moment of periodic reading, the measurement is repeated after the Delay interval

Periodic and non-periodic data upload

Sensor values are uploaded to the server periodically in the fixed period, which is configured via the portal. However, in addition to the periodic upload, data can be also uploaded if the following happens:

- 1) SIM card is inserted
- 2) Device power is connected or changed
- 3) The button is pressed
- 4) SafeRange is exceeded (if the Delay is set, then only after the Delay elapses)

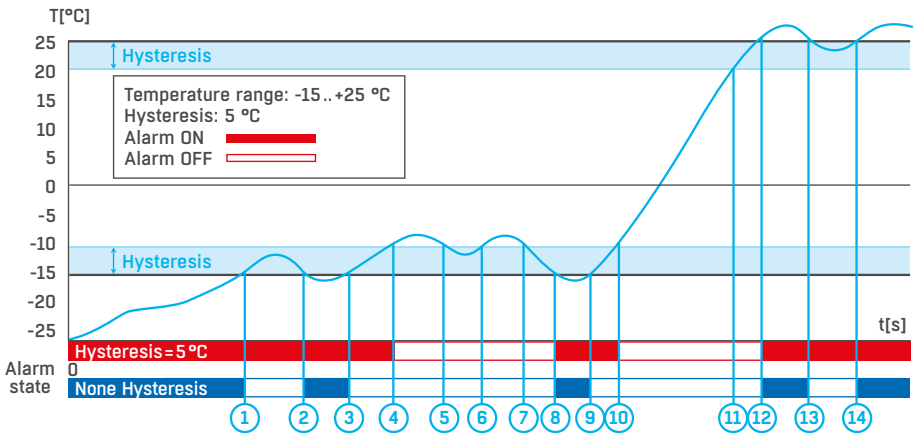
SafeRange – range of allowed values

SafeRange is configured in the portal independently for each sensor. Whenever the measured value passing by this range, a message to the portal is sent (even out of the Data Upload period - default 10 h).

To extend life time of the device powered from the battery, sensors are read only in the Logging period (default 15 min). With the exception of SD-2xIN, sensors are NOT read at other period. If a Delay is set together with the SafeRange, the repeated measurement is performed at the next Logging period, and an Alarm is raised only if the repeated measurement is also out of the SafeRange.

Hysteresis / Idle range (sensor value)

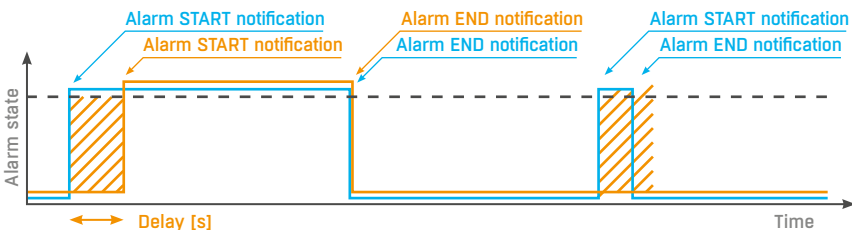
The Hysteresis setting defines a tolerance range for suppressing alarm alerts. The function prevents multiple alarm alerts (too many emails from the portal) if the reading oscillates around the specified threshold. The hysteresis is configured independently for each sensor.



The figure demonstrates two cases. Without the hysteresis idle range of 5°C, the alarm raised in point 8 would end in point 9; however, the hysteresis function keeps the alarm active until the temperature reaches the upper limit of the tolerance band (point 10): $5\text{ °C} + (-15\text{ °C}) = -10\text{ °C}$.

- **Hysteresis=5°C** – The unit sends **3 Email (SMS) messages**. Alarm active in points **0..4, 8..10, 12 and beyond**.
- **No hysteresis (0°C)** – The unit sends **8 Email (SMS) messages**. Alarm active in points **0..1, 2..3, 8..9, 12..13, 14 and beyond**.

In determining when the Alarm ends, the Hysteresis value applies. The end of an Alarm is only notified when the measured value is well within the SafeRange. However, the value is only read according to the Log Period.



Alarm status notification based on a Delay value:

- **Blue:** Delay = 0
- **Yellow:** Delay is non-zero

To increase battery life, be careful when setting the SafeRange and Hysteresis values.

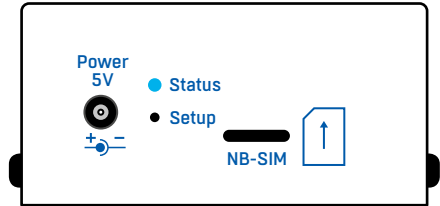
Description of HW elements

LED indicator (Status)

The blue LED gives a quick status indication for debugging and troubleshooting. It can indicate these states:

- **Short flash** – reading of sensors and inputs
- **Rapid flashing** – registration to the NB-IoT network
- **Continuously on** – communication over the NB-IoT network, data transfer

When power is connected to the device, the indicator briefly lights up to indicate modem initialization and 1-Wire sensor detection. Then, it quickly flashes as the device connects to the network, and lights up whenever the device communicates with the portal. It also briefly flashes when the 1-Wire sensors or the WLD cable state are being read.



Setup button

The button is used to send values to the portal immediately and to detect sensors.

- **Press** – sensors are detected and data are sent to the portal
- **Press for longer than 10 s** – reset to factory defaults

Setting up the device

- 1) Attach the external antenna
- 2) Connect 1-Wire sensors (NB-2x1Wire only)
- 3) Insert SIM card
- 4) With a slight force, pull out the insulating strip that insulates the battery from the contacts
- 5) Connect the external power supply and wait until the device connects to the operator's network (i.e. until the blue LED turns off). Depending on the network and device configuration, this can take up to 20 minutes (when the device is first connected to an operator's network, including in a new country or region). During this time, do not disconnect external power to avoid battery drain.
- 6) Default portal where are devices connected is www.HWg-cloud.com.

To install new device are 2 options:

- a) You have **existing account** on the **HWg-cloud** and you would like to **adopt** new device to this one account. (See page 9)
 - b) You have existing account on **another SensDesk technology based portal** (www.SensDesk.com or www.HWportal.cz for example) and you would like to **migrate** new device to this one account. (See page 10)
- 7) Define sensor name & SD SafeRange for each sensor. (See page 12)

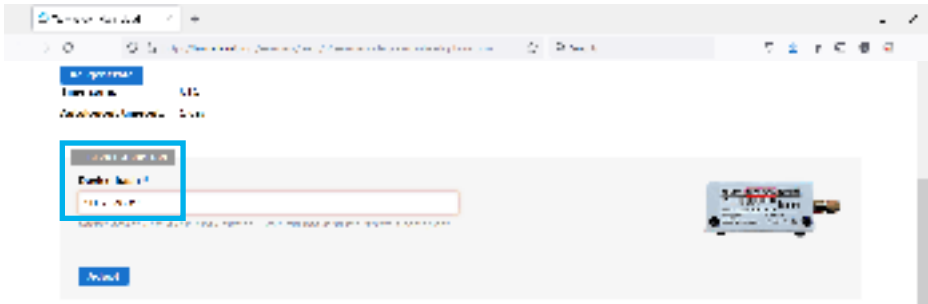
6a) Adopt new device to HWg-cloud.com

Open the www.HWg-cloud.com website, login to your account and go to the **My Team** page.

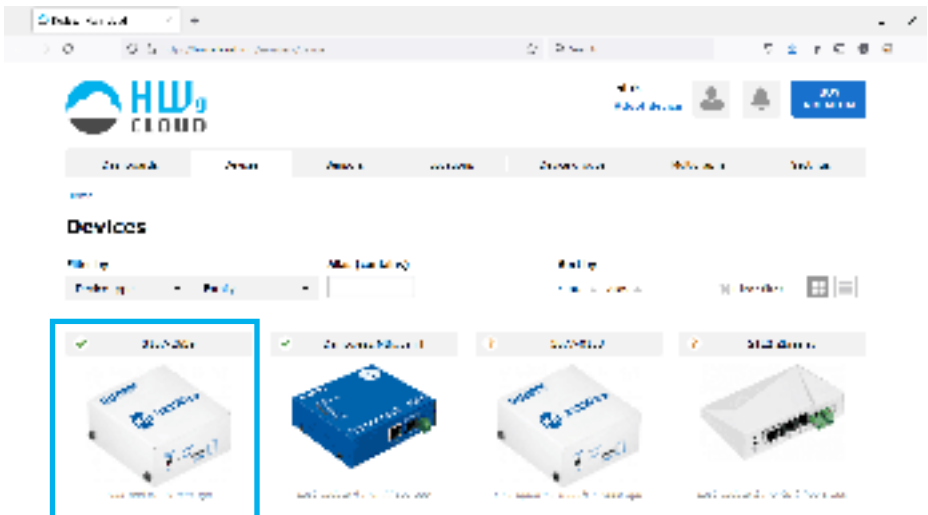


Scroll down to the **Device Adoption**.

Fill the device hash (1234-5678 number on the label of physical device)

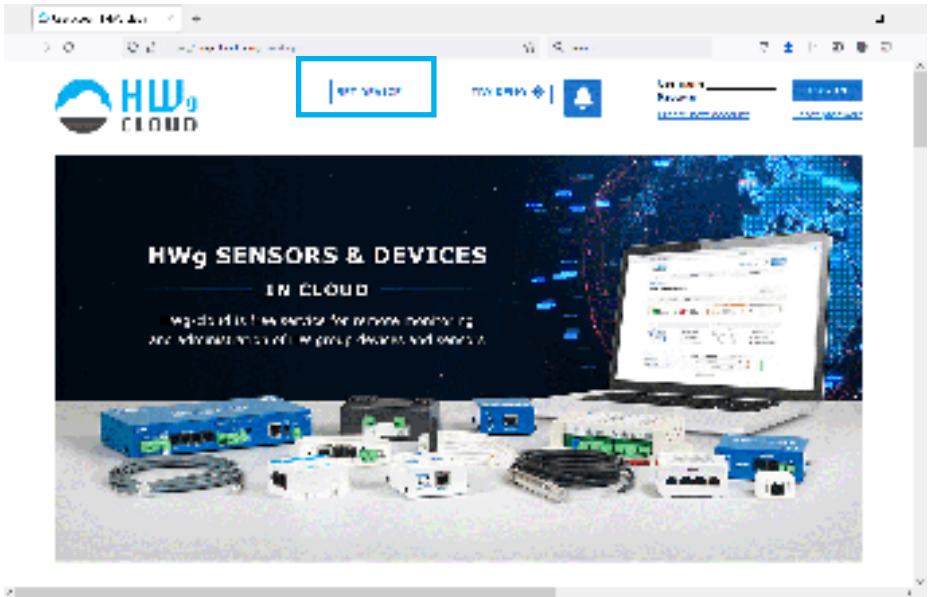


Device will appear after some time in the devices:



6b) Migrate new device from HWg-cloud.com to another portal

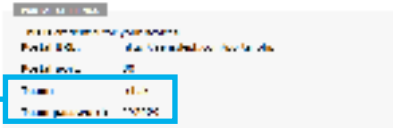
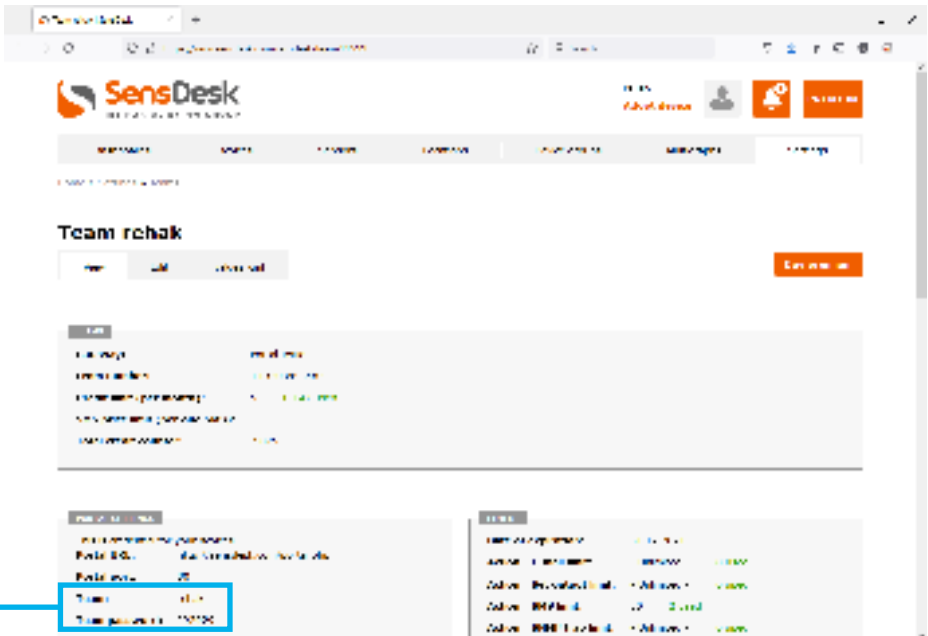
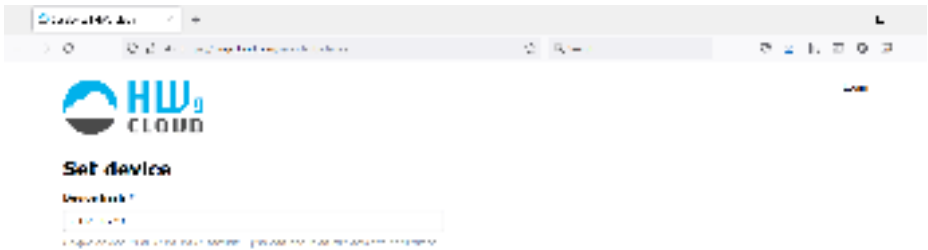
Open the www.HWg-cloud.com website, do not log in, click to **Set Device** button on the top of the page.



Fill the device hash (1234-5678 number on the label of physical device)



As **Team login & Team password** fill data from the SensDesk technology based portal, where you have the account. You will find them on the Team page.

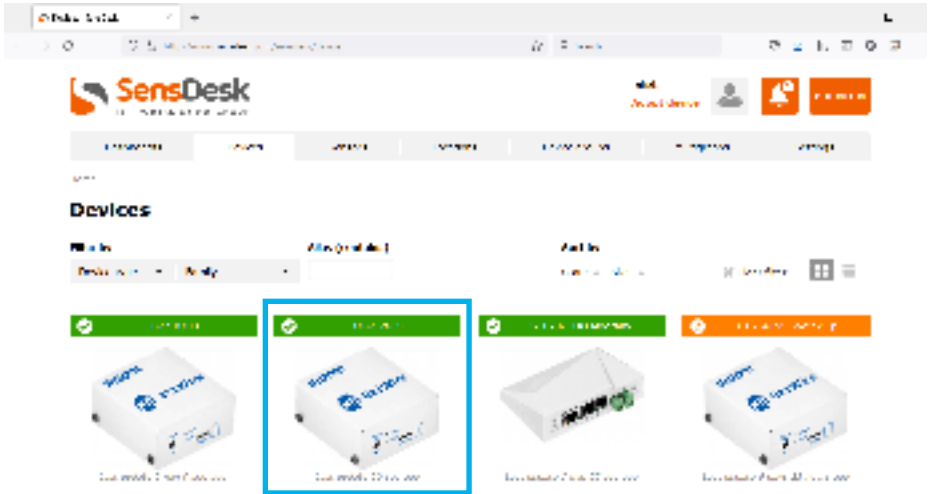


After you click to **Save** button on the web page, take a pencil or other tool and briefly **press the Setup button on the device**. It will start blinking (communication with the portal) and finalize device migration process.



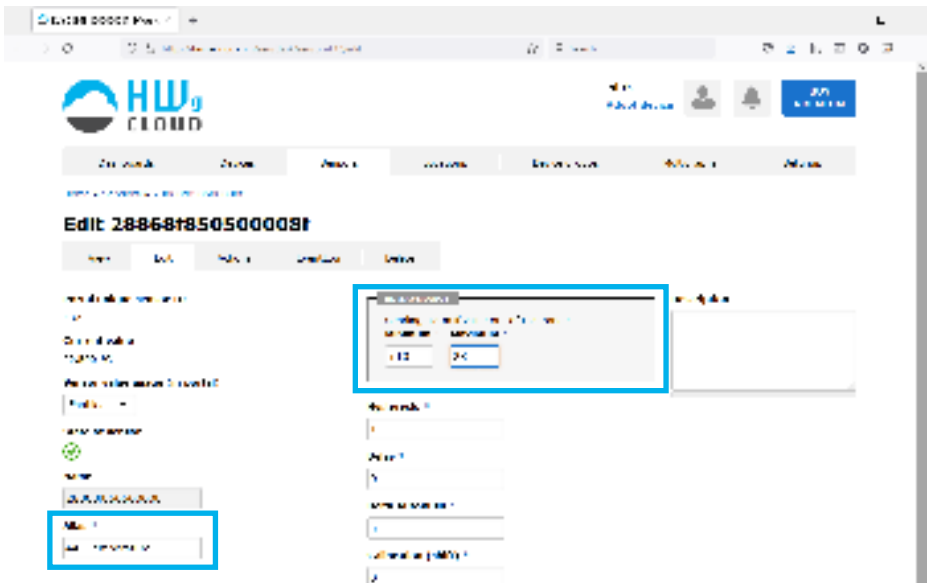
Setup button

Device will appear in the Device list:



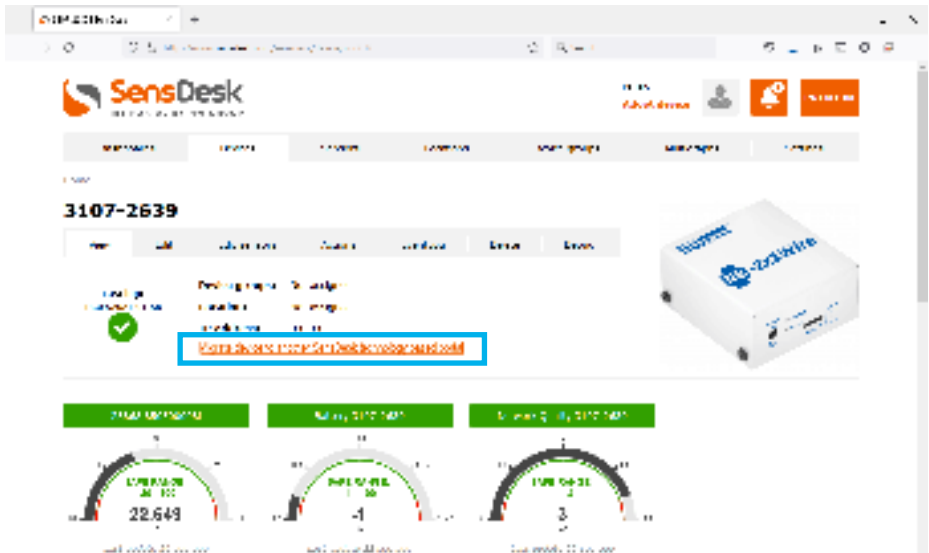
7) Define sensor name & SD SafeRange for each sensor

Part of the device installation is to define sensor name & SD SafeRange for each sensor. Define SD SafeRange to significantly speed-up alerts when sensor value oscillate around the SafeRange limit.

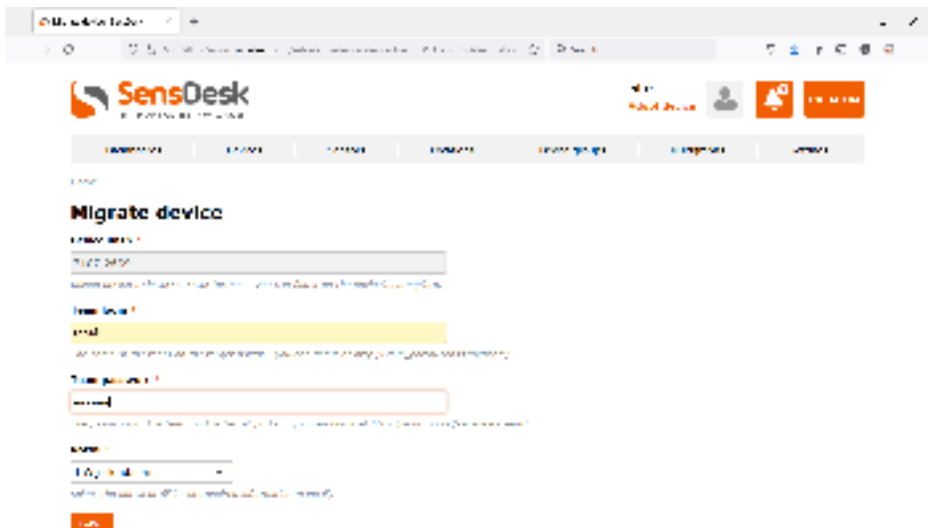


Migration of connected device

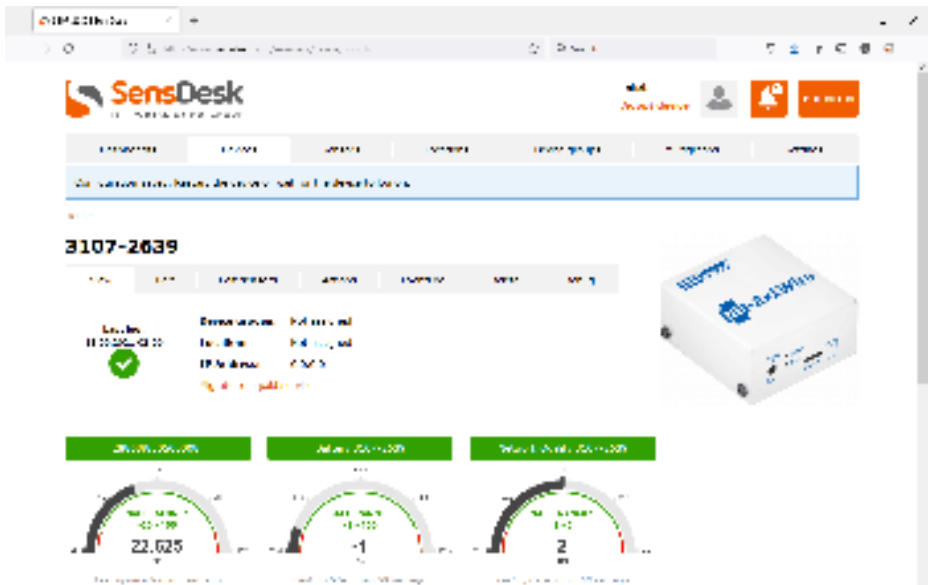
Connected and working device can be also easily migrated from one portal to another. For example in this case from paid portal www.SensDesk.com to free www.HWg-cloud.com.



Fill Team login and Team password, choose the right SensDesk technology based portal.

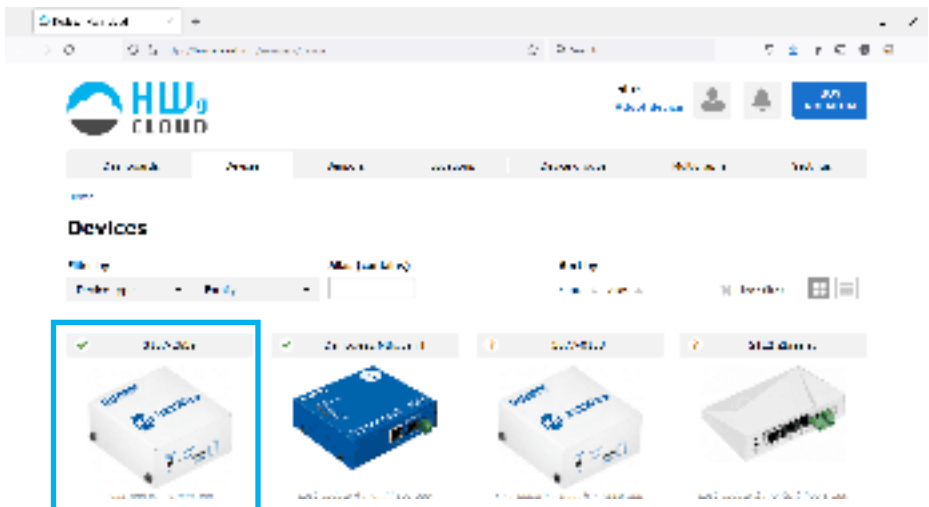


After you click to **Save** button on the web page, take a pencil or other tool and briefly **press the Setup button on the device**. It will start blinking (communication with the portal) and finalize device migration process.



Device will appear on the target portal.

Only sensor names will be transferred between the portal. No more device configuration or data history!



SensDesk.com portal features

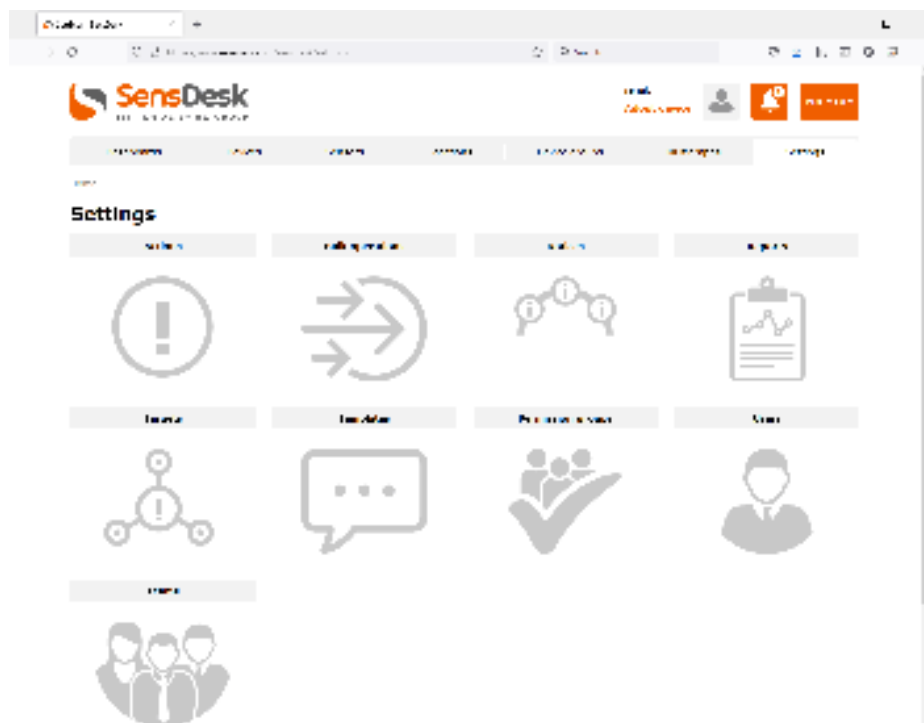
Graphs of values



SMS & Voice call alerts

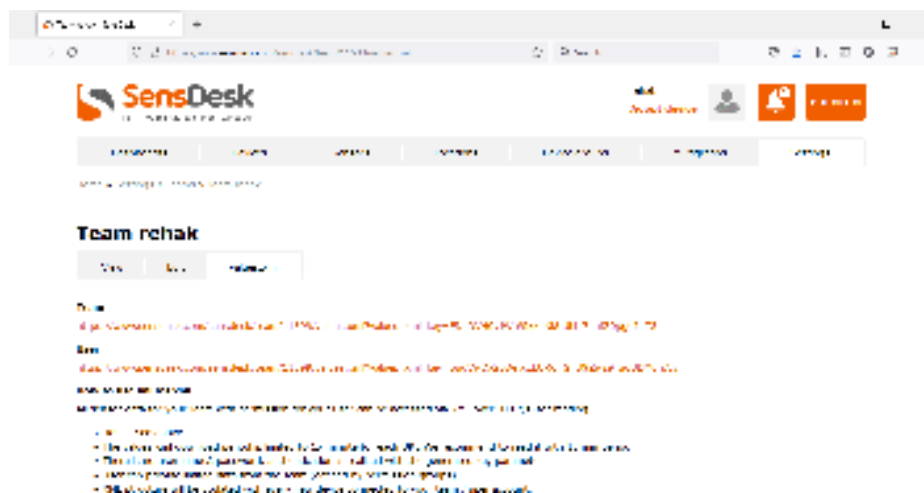
The screenshot shows the SensDesk.com portal interface. At the top, there is a navigation bar with the SensDesk logo and several icons. Below the navigation bar, there are tabs for 'Sensors', 'Alerts', 'Users', 'Settings', 'Reports', and 'Groups'. The main content area is titled 'Actions on sensor Temperature local'. There are several input fields and buttons. A blue speech bubble with the text 'Enable Voice call in SMS settings' points to a specific area. At the bottom right, there is a large circular icon with an exclamation mark and a plus sign.

Other features & PDF reports



The screenshot shows the SensDesk portal interface. At the top, there is a navigation bar with the SensDesk logo on the left and user information (name, profile icon, notification bell, and 'Logout' button) on the right. Below the navigation bar is a horizontal menu with tabs for 'Dashboard', 'Users', 'Groups', 'Settings', 'Configuration', 'Reports', and 'Help'. The 'Settings' tab is currently selected. The main content area is titled 'Settings' and contains several large, greyed-out icons representing different configuration categories: 'General', 'Integration', 'Users', 'Groups', 'Security', 'Notifications', 'Permissions', and 'Users'. At the bottom, there is a 'Team' section with an icon of three people.

Open API (SNMP & XML)

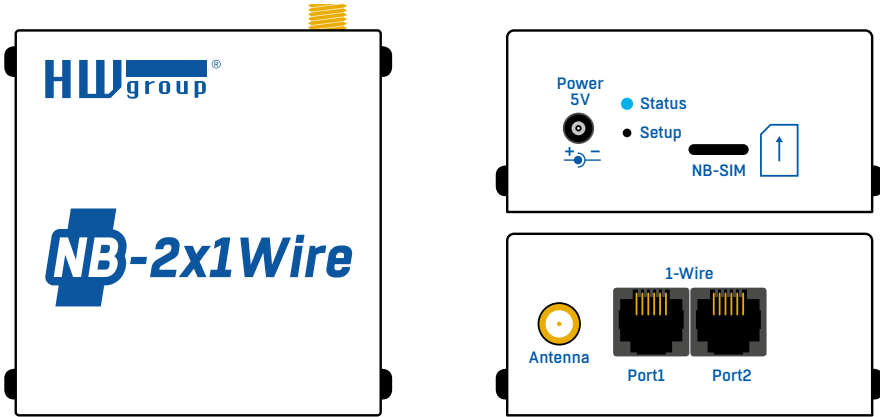


The screenshot shows the SensDesk portal interface for the 'Team rehak' page. The navigation bar and menu are identical to the previous screenshot. The 'Team rehak' section is active, showing a sub-menu with 'Users', 'Groups', and 'Members'. The main content area displays the following information:

- Team**
- API** - SensDesk provides REST API for all SensDesk features. For more information, please refer to the API documentation.
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NB-Devices models and their specific features

NB-2x1Wire

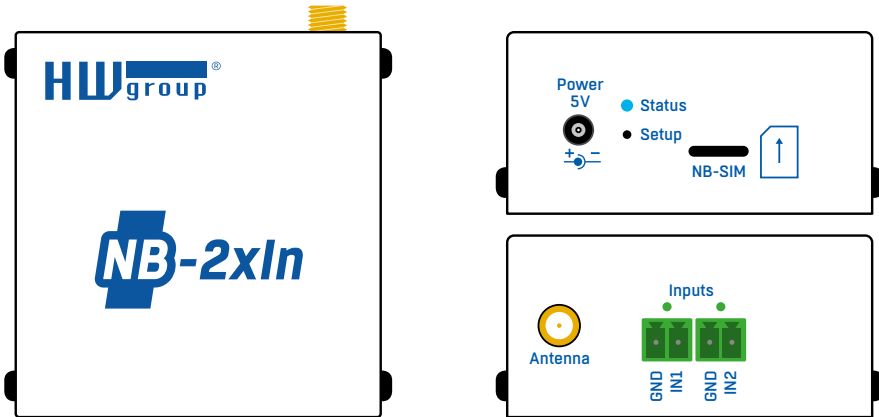


A device for connecting external sensors of Temperature, Relative Humidity, Voltage or other values via the RJ11 1-Wire (UNI) bus. Allows connecting several sensors to measure up to 4 quantities simultaneously.

Sensors are detected whenever power is connected to the device or the Setup button is pressed. The device can be powered from an external 5V adapter, from its internal battery, or using a combination of these. With a single connected Temp-1Wire IP67 temperature sensor and the default sensor reading and data upload periods, the battery lasts up to 3 years. When using 1-Wire UNI sensors, either the sensors or the NB-2x1Wire device should be powered from an external adapter because such sensors significantly reduce the battery life.

External sensors	
Port / connector	Port1, Port2 / RJ11 (1-Wire, 1-Wire UNI)
What can be connected	2 external sensors. One combined temperature + humidity sensor can be also connected
Sensor types	Only sensors by HW group s.r.o.
Sensors / distance	4 values, max. 2 probes per port (max. 60m total length per port)
Alarm LED	Alarm Port1 – Alarm SENS – lights up if the sensor is in alarm – on external power only

NB-2xIn



Remote monitoring device for connecting external detectors to 2x DI (Digital Input). To each DI input you can connect a door or window contact, a PIR motion detector or a smoke / gas detector with a dry contact (relay) output.

Pulse counter (SO) on each DI input

Advanced feature of each DI input is 4bytes pulse counter for counting pulses. To each DI input you can connect energy or water meter with pulses (SO) output. Only pulses longer than 20 ms are detected. Due to high energy requirements of SO outputs, external power is required for reliable pulse counting. When device powered from internal battery, reliable operation cannot be guaranteed.

Alarm state

The input mode (Alarms or Counters) can be changed in the Digital Input configuration at the portal using the "Alarm level" parameter.

If the "Not Defined" option is selected (default portal configuration), DI input is in pulse counting mode and 0/1 state is communicated only in the regular data upload period.

When Alarm level=1 or Alarm level=0, DI input is in the Alarm mode. The input 0/1 state is communicated in the regular data upload period as well as whenever there is a state change. To comply with the transmission limit, the device will send no more than 3 alarms per 10 minutes. Frequent state changes can have a significant impact on battery life.

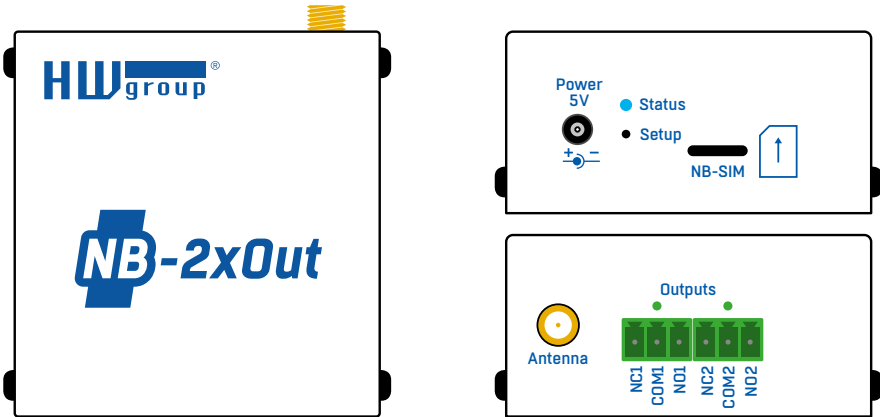
For battery operation, wiring cables should be as short as possible to avoid false pulses.

LED indication

The default mode is the counter mode (i.e. Alarm level = Not defined). When DI input is activated (=1/contact closed) and the device is powered from an external adapter, the respective green LED lights up. The LEDs are inactive on battery power.

DI – Dry Contact Inputs	
Port / connector	I1, I2 / terminal block ø2 mm
Type	Digital Input (supports NO/NC Dry contact)
Sensitivity	1 (On) = 0 – 500 Ω
Max. distance	Up to 10 m
Counter sensitivity	20 ms
LED	2× green – input contact closed – on external power only
Pulse counter	External power required for reliable pulse counting – S0 = min 5V / 2 – 10 mA.

NB-2xOut



IoT monitoring device 2 DO (relay outputs) controlled from the portal over the NB-IoT network. It can be connected to any SensDesk technology based portal.

To reduce power consumption (when running from internal battery), the device using internally latching relays. To increase reliability, internal relays are energized periodically every 10 minutes. When powered from internal battery only, estimated battery life time is around 2 years.

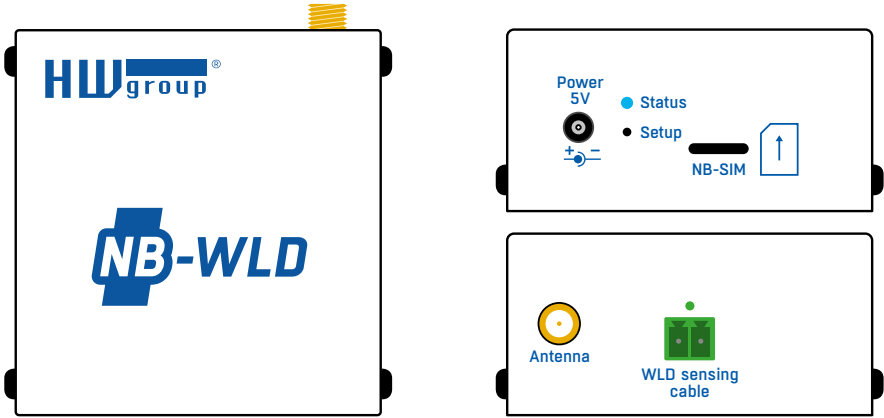
Note: *The device is not suitable for mobile applications (in car for example).*

LED indication

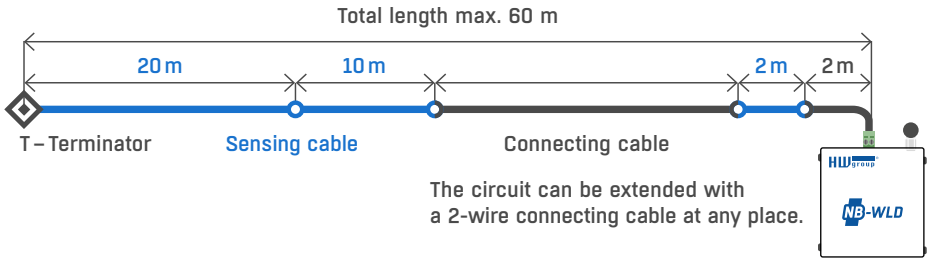
When powered from external adapter, output states are signaled by yellow LED when output = 1. The LEDs are inactive on battery power.

Relay outputs	
Type	Latching (bipolar) relay
Connector	Terminal block
Rating	Max. 500 mA at 125 V AC, 1 A at 30 V DC
LED	2× green – output contact closed – on external power only

NB-WLD



Water Leak Detection unit with 1 zone input (external WLD Type A moisture-sensing cable). Length of external cable can be max. 60 m (any combination of WLD sensing + non-sensing prolong cable).



The flood detection is performed every 5 min. (15 min. when powered from the battery). Estimated battery life with 15 min. detection is 4 years.

If the cable is flooded or disconnected and the device is powered from an external adapter, the red LED lights up.

Note: *The LED is inactive on battery power.*

WLD cable	
Type	Moisture sensing cable
Connector	Terminal block
Sensor states	0 = OK, 1 = Flooded, 2 = Cable disconnected
Sensing cable length	Max. 60 m in total (WLD sensing cable + prolong cable)
Cable extension	May be extended by at most 20 m, AWG 24
LED	1× red – activated or cable disconnected – on external power only

Technical specifications for all models

NarrowBand	
Supported bands	B1 / B2 / B3 / B4 / B5 / B8 / B12 / B13 / B17 / B18 / B19 / B20 / B25 / B26* / B28 / B66
Certifications	<p>Carrier: Vodafone (Global) Deutsche Telekom / Telefónica* (Europe) AT&T / T-Mobile / Verizon* / Sprint* (North America) LGU+* (South Korea) SoftBank / NTT DOCOMO* (Japan) Telstra* (Australia)</p> <p>Regulatory: GCF (Global) CE (Europe) FCC / PTCRB (North America) IC (Canada) KC (South Korea) NCC (Taiwan) JATE / TELEC (Japan) RCM (Australia) NBTC (Thailand) IMDA (Singapore)</p> <p>Others: RoHS ATEX (Europe)</p>
Output power	23 dBm ±2 dB
Sensitivity	129 dBm
Antenna	External, SMA
Supported protocols	IP: UDP/IP (COAP)

Power	
Supply voltage	5 VDC / 120 mA
Connector	Jack Ø 3.5 x 1.35 / 10 mm
Battery	Lithium 3V model CR123A

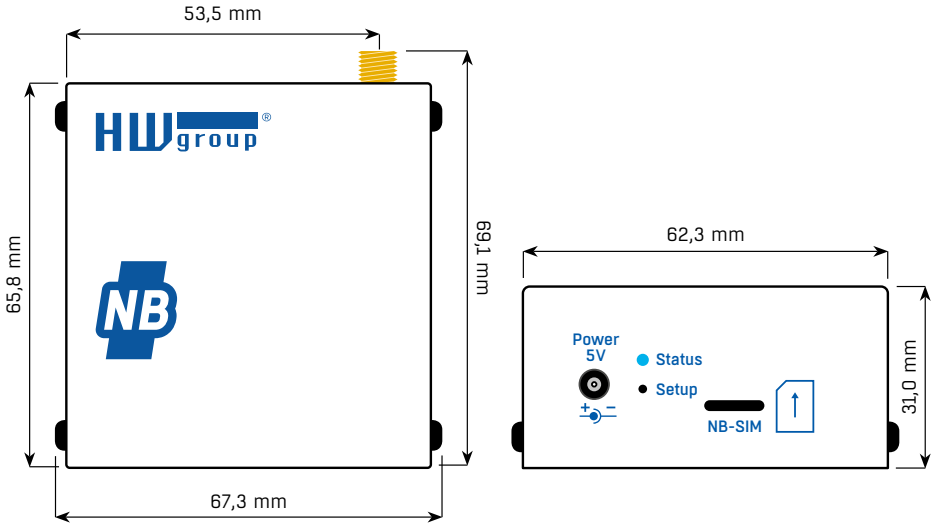
Common LEDs	
Status	Blue – communicating in the NB-IoT network (on), connecting to the network (flashing), reading sensors (brief flash)

Button	
Setup	Short press – sensor detection, immediate upload of values on portal Pressed for longer than 10 s – reset to factory defaults

Miscellaneous	
Operating temperature	-10 to +60 °C (for the device – sensors may support different operating ranges)
Dimensions / weight	67×78×33 mm / 250 g
Electromagnetic radiation	CE / FCC Part 15, Class B
EMC	EN 55022, EN 55024, EN 61000

* Under development

Mechanical dimensions



More monitoring devices by HW group



Poseidon2 4002

Designed for demanding monitoring applications, such as in data centers and industrial settings.



Poseidon2 3468

Remote monitoring of temperature, humidity and other sensors. Industrial version.



Poseidon2 3266/3268

Basic unit for monitoring temperature, humidity, and other sensors over the network.



Ares 10/12

Remote environment monitoring at any place with GSM coverage.



SD family

Simple devices for the monitoring of temperature, humidity, voltage, current, and other parameters.



WLD2

Quad water leak detector with WiFi and Ethernet.

NB-Devices have to be connected to one of the portals:



www.HWg-cloud.com	www.SensDesk.com	Portal providers
<ul style="list-style-type: none"> • SaaS (Software as a Service). • Default portal for all HWg devices (latest FW required). • Basic free portal for 20 HW group devices (all types). • Simple Email alerts for 2 recipients. • 10 days history, no API, no SMS, basic graphs. • Devices can be migrated to any other portals. • Based on SensDesk technology. 	<ul style="list-style-type: none"> • SaaS (Software as a Service). • SensDesk is technology. • SensDesk.com is public example of this technology (by HWg). • It's Paid option for all HWg devices. • 3 subscription plans (5D / 10D / 25D for 1 year). • Differences are also in service mix (how many SMSs, PDF, ...) not device limit only. • Any subscription plan can be ordered with 1 year voucher. 	<ul style="list-style-type: none"> • SaaS (Software as a Service). • Paid service provided by HW group partners. • Various mix of free / paid services. • Based on SensDesk technology. <ul style="list-style-type: none"> • SensDesk.at / .gr / .lv / .ro / ... • HWportal.cz • Other (list on HWg-cloud.com).



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