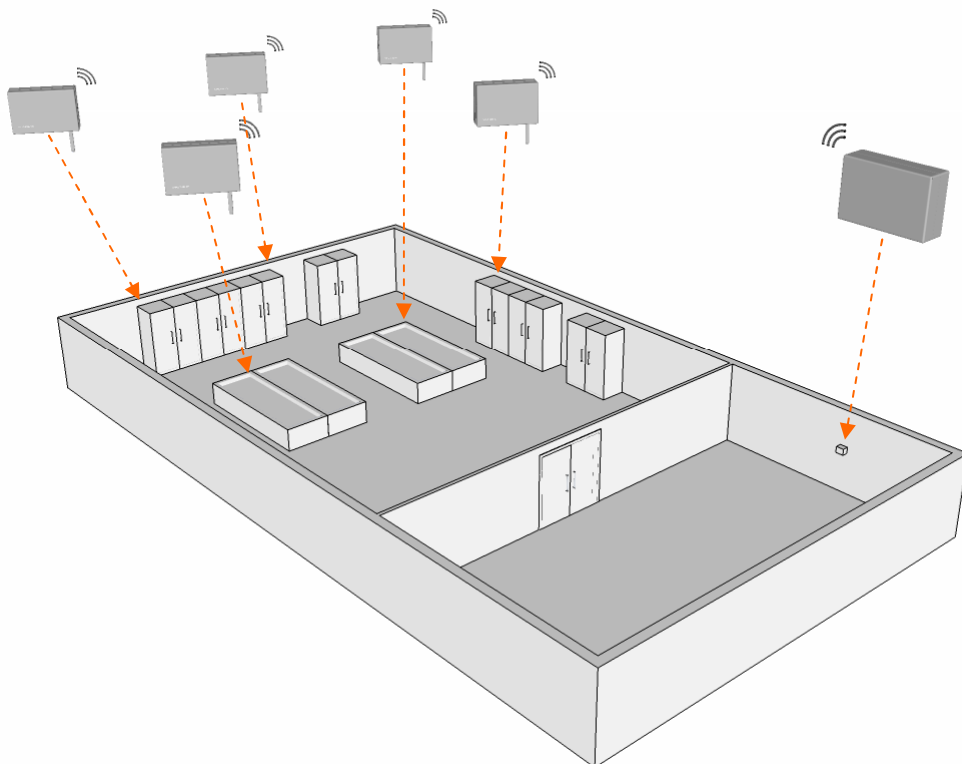


# Wireless monitoring network for supermarkets

Compliant to EN 12830

## System description



# 1 System overview

The wireless sensor network from WNC consists of wireless sensors located in freezers and refrigerators in supermarkets and other food stores. Each sensor detects the temperature at configurable intervals (typically every minute) and forwards the data through a dedicated 433MHz short radio link to the WNC radio master. The radio master is typically located in the supermarket office area.

The radio master forwards the data collected to a central operation centre, either directly through Internet or the GSM network (using GPRS), or through a local gateway or PC.

The basic configuration of the system is shown in the figure below.

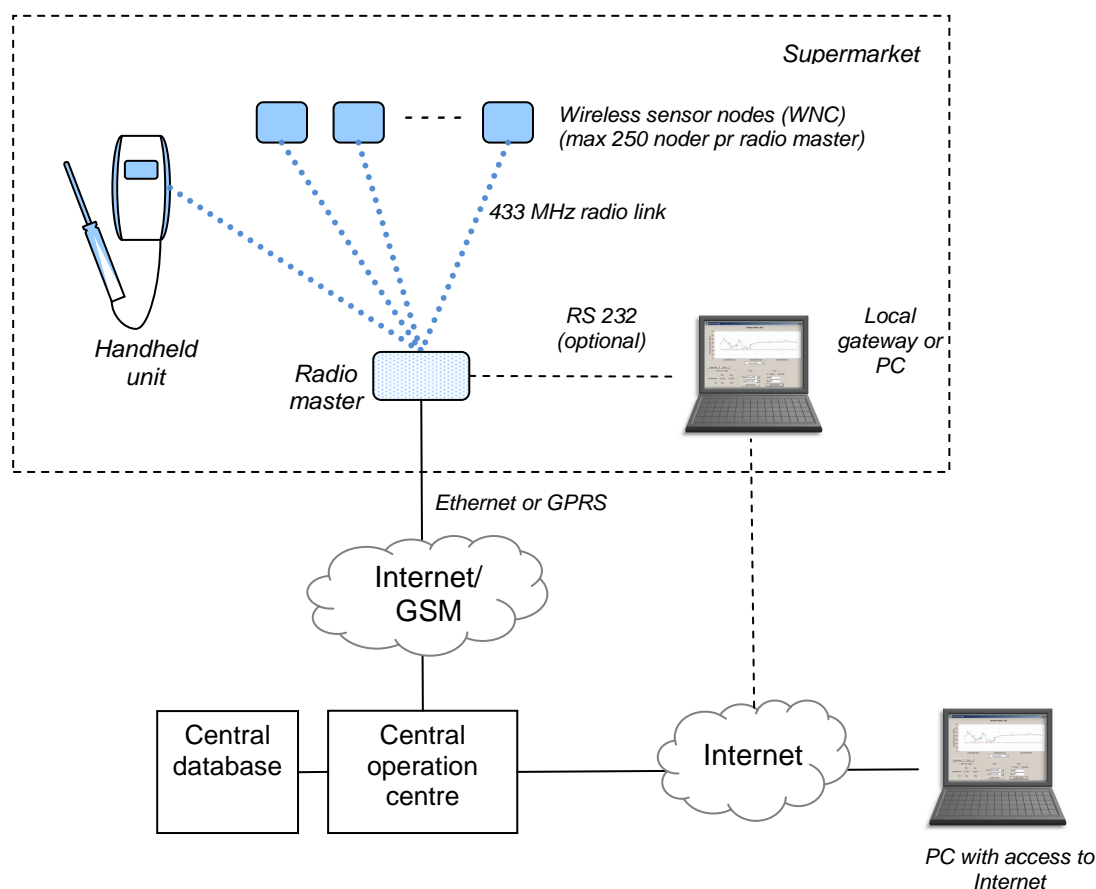


Fig.1 Basic network configuration

## Robust radio network

WNC has developed a 2-way, intelligent and robust radio network to handle the harsh environments in supermarkets. Different mechanisms have been implemented to handle interruptions, noise, interference and possible power failures in the supermarkets.

## Radio repeaters

In case of difficult radio conditions or long distances, it is possible to introduce radio repeaters in the network. The figure below shows such a configuration.

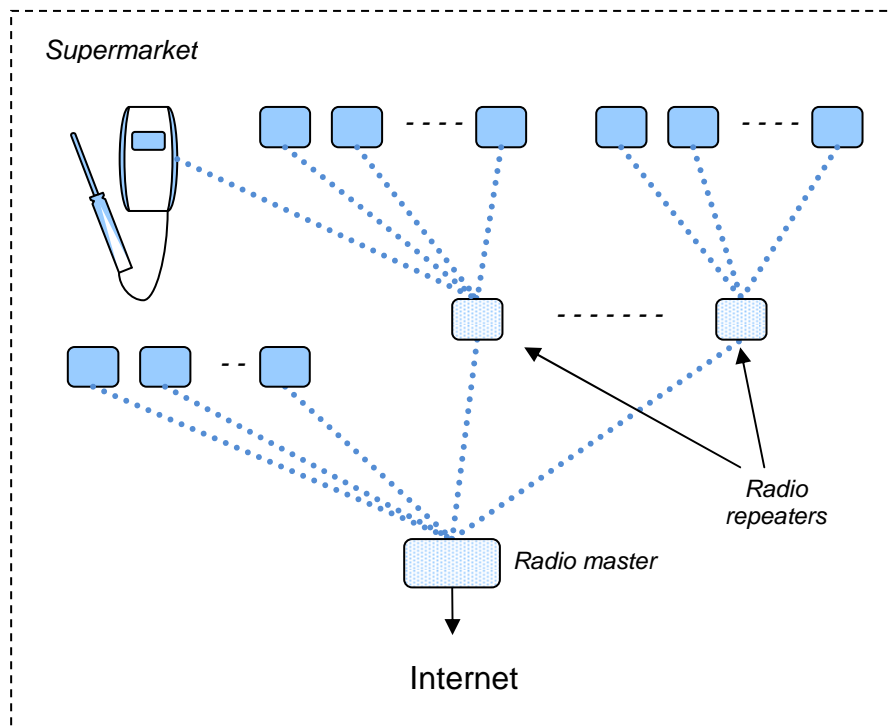


Fig 2. Network configuration with one or several radio repeaters

## Meshed networks

Each sensor node will automatically look for alternative routes to the radio master in case the existing radio link is disturbed or lost. In order to limit the data traffic through the repeater nodes, each sensor is programmed to connect directly to the radio master when possible.

## **Remote configuration and software upgrades**

The 2-way radio network enables the operator to change the configuration (for the measurement interval) on all nodes remotely from the central operation centre. The operator may configure all nodes simultaneously or individually. Any software upgrades (for example with new functionality) may also be downloaded from the central operation centre.

## **Historical data buffer**

In addition to forwarding the measurement data at regular intervals, each node stores the measurements for the last 4 weeks in an internal data buffer. This ensures that important data is not lost even if the communication networks is lost (for example due to power failure, or if nodes are pulled out of radio coverage). Any part of the historical buffer can easily be accessed by the operator from the central operation centre.

## 2 Wireless nodes

### 2.1 Sensor nodes

There are three different sensor nodes:

1. Node with 1 sensor interface
2. Node with 2 sensor interfaces
3. Node with 4 sensor interfaces

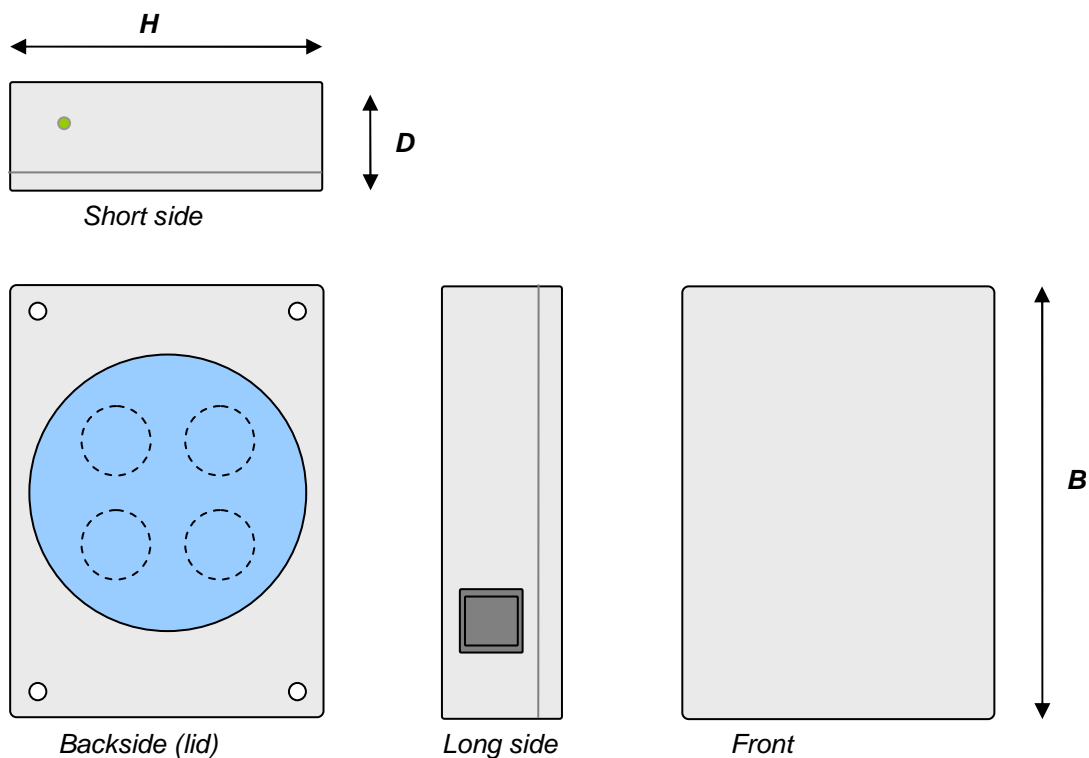
Each sensor interface may have 4 different applications:

1. Temperature sensor
2. Relative humidity sensor (includes also temperature)
3. Digital input
4. Digital output



*Sensor node with 1 sensor*

### Sensor node - Technical specifications



<b>External sensor:</b>	Temperature and relative humidity (RH)
<b>Extended sensor cables:</b>	1,5 meter, 3 meters, 6 meters
<b>Sensor interface:</b>	RJ-11
<b>Measurement range:</b>	-40 °C to +85 °C 0 % to 100 % RH.
<b>Accuracy:</b>	± 0,5 °C at 0 °C to +70 °C ± 2 % RH (typical)
<b>Resolution:</b>	0,125 °C 0,5 % RH
<b>Storing conditions:</b>	-30 °C to +50 °C (20 °C to 25 °C for optimal battery lifetime)
<b>Measurement interval:</b>	1 – 60 minutes (configurable)
<b>Sending interval:</b>	1 - 60 minutes (configurable)
<b>Power:</b>	Battery powered
<b>Internal supply voltage:</b>	3,6 V
<b>Battery type:</b>	AA Litiumtionylclorid, 2,5 At, 3,6V, short circuit protection (bobbin)
<b>Battery life time:</b>	5 – 10 years (estimated under normal operation)
<b>Physical dimensions:</b>	57 x 86 x 28 mm (H/B/D)
<b>Weight:</b>	96 g
<b>Cover material:</b>	ABS plastic
<b>Attachment:</b>	By 4 magnets inside lid. Covered with friction tape
<b>Radio frequency:</b>	433.05 – 434.79 MHz (ISM frequency band)
<b>Max output power (radio):</b>	10 mW (10dBm)
<b>Approval:</b>	CE



*Sensor node with RH sensor*



*Sensor node with Digital-in sensor*

## 2.2 Sensors

Several different sensors are available

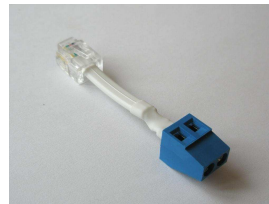
- Temperature sensor (cable length 5cm - 1,5m - 3m - 6m)
- RH-sensor
- Digital-in (cable length 5cm - 1,5m - 3m - 6m)



*Temp sensor (5cm)*



*Temp sensor (6m)*



*Digital-in*



*RH-sensor (5cm)*

The sensors can be connected to any sensor node. The sensor nodes automatically detects which type of sensor which is connected to the respective sensor node

## 2.3 Handheld unit

The system includes a handheld unit which is used for measuring temperature on delivered goods and/or to perform random temperature measurements on different locations in the supermarket.

When activated, the unit will measure the temperature every second, and the last measurement is shown on the display. The user uses either the keyboard to enter the product number (of the food/goods being measured), or selects the respective product from a product list displayed on the LCD.

As soon as the temperature measurement has stabilized, the user may trigger the unit to forward the measured data (attached to a product number) to the radio master.

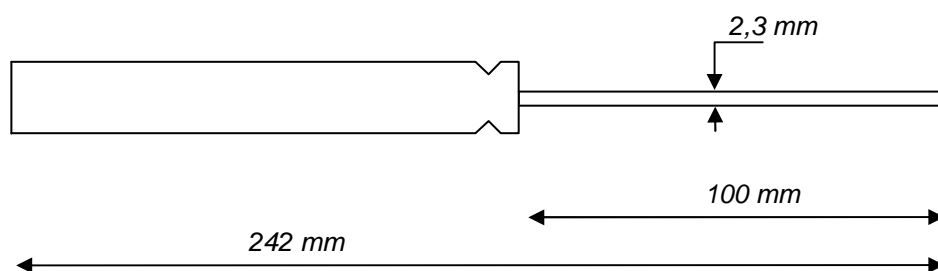
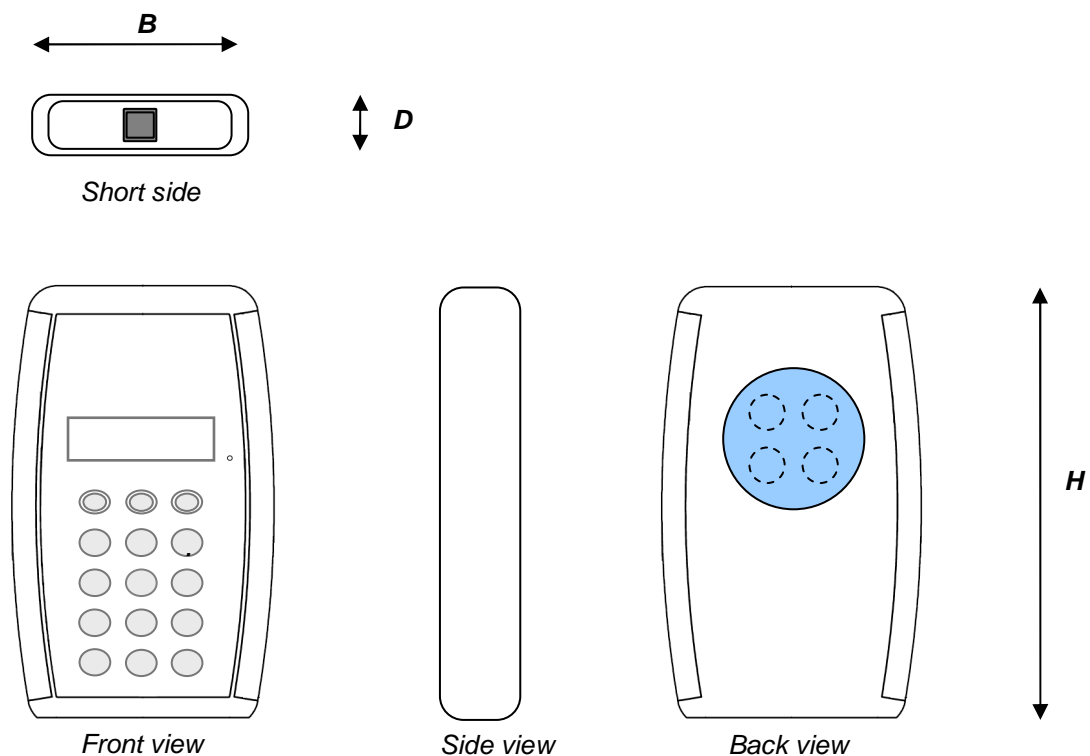
The data is automatically forwarded to the central operation centre as from the other sensor nodes in the network.

The unit turns off automatically after 20 minutes if no activity is detected in this time period. It is also possible to manually turn off the unit.



## Handheld unit – Technical specifications

<b>Temperature sensor:</b>	1 external temperature sensor (probe).
<b>Sensor interface:</b>	RJ-11
<b>Measurement range:</b>	-40 °C to +125 °C (probe)
<b>Accuracy:</b>	± 0,5 °C at 0°C to +70 °C ± 2 °C at -55 °C to + 125 °C
<b>Resolution:</b>	0,125 °C
<b>Storing conditions:</b>	-30 °C to +50 °C. (20 °C to 25 °C (for optimal battery life time)
<b>Measurement interval:</b>	1 second
<b>Sending interval:</b>	Manually (after user acceptance of temperature measurement)
<b>Power supply:</b>	Battery
<b>Internal supply :</b>	3,6 V
<b>Battery type:</b>	AA Litiumtionylclorid, 2,5 At, 3,6V, short circuit protection (bobbin)
<b>Battery life time:</b>	5 – 10 years under normal operation, 4 – 6 months under continuous operation
<b>Physical dimensions:</b>	147 x 88 x 24 mm (H/B/D)
<b>Physical dimensions (probe):</b>	(see drawing below)
<b>Cover material:</b>	ABS plastic
<b>Attachment:</b>	By 4 magnets inside lid. Covered with friction tape
<b>Radio frequency:</b>	433.05 – 434.79 MHz (ISM frequency band)
<b>Max output power (radio):</b>	10 mW (10dBm)
<b>Approval:</b>	CE



## 2.4 Radio master

The radio master collects the measurement data from all the different sensor nodes in the supermarket. Normally one radio master is installed in each supermarket. However, several units may be deployed to cover a higher number of sensor units. The data is forwarded to a central operation centre for further data processing, storing and presentation.

There are 3 different versions of the radio master:

- Radio master, RS 232 (for connection to local gateway or PC)
- Radio master, Ethernet (for connection to Internet)
- Radio master, GPRS (for connection through GSM and Internet)

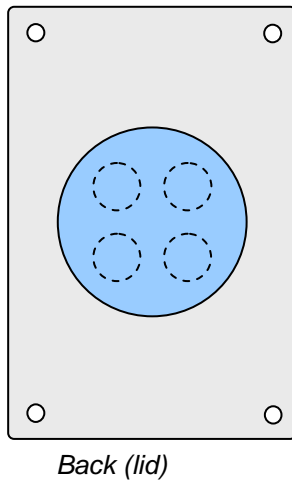
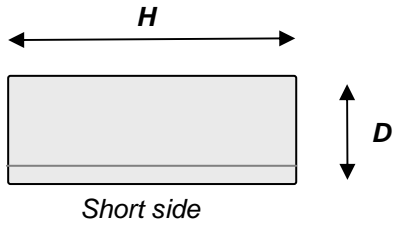


*Radio master (version with RS232 interface)*

### Radio master – Technical specifications

<b>Storing conditions:</b>	-30 °C til +50 °C. (20 °C til 25 °C for optimal batterilevetid)
<b>Power supply:</b>	100 - 240 VAC, 50–60 Hz.
<b>Internal supply voltage:</b>	3,4 VDC
<b>Physical dimensions:</b>	67 x 121 x 37 mm (H/B/D)
<b>Cover material:</b>	ABS plastic

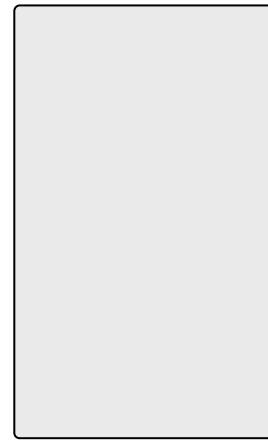
**Attachment:** By 4 magnets inside lid. Covered with friction tape  
**Radio frequency:** 433.05 – 434.79 MHz (ISM frequency band)  
**Max output power (radio):** 10 mW (10dBm)  
**Approval:** CE



Back (lid)



Long side



Front

