

ThermoSense

Wireless Communicating Thermostats



Upgrade your standalone HVAC Terminal units (FCUs/DXs) to a connected system, enhancing Indoor comfort monitoring.

Product Overview

MachineSens IoT® ThermoSense is a high-tech, plug-and-play intelligent wireless temperature control device designed to revolutionize indoor comfort management. Featuring an extra-large LCD capacitive touch screen with customizable color icons, this intelligent device allows for both manual and automatic fan speed selection.

This innovative device is specifically designed to retrofit standalone thermostats used to control Fan Coil Units (FCUs) and DX units, enabling centralized control and monitoring.

ThermoSense excels in real-time monitoring, tracking actual and set room temperatures to precisely control valve openings/closings and fan speeds, ensuring the room temperature aligns with the occupant's desired comfort.

It boasts one open/close contact input, three relay fan outputs, and one compressor output. The device supports single or 3-speed fans, one or two on/off valve actuators, and one 1-stage compressor in DX-type equipment.

Additionally, it offers manual or automatic 3-speed fan control, Auto, Heat, Cool, and Ventilation modes, and a universal input for an external sensor or windows/energy-saving contact.

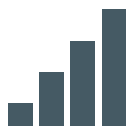
The adjustable high and low setpoint limits provide added flexibility. Available in both semi-flush mounted and surface-mounted versions, **ThermoSense** fits any British Standard (UK/Middle East) wall-mounted installation box.

By offering automated and centralized energy management, **ThermoSense** contributes to up to a 25% reduction in energy expenditures, making it an ideal solution for enhancing efficiency and comfort in any property.

Product Features



NRF Communication
for secure and fast
data transmission



**High Range Link: Up to
200m between IoT
gateway and Thermostat**



**Secure operation
with top-down
encryption**



**Bi-directional
communication for
remote operation and
control**



**Extra Large Color
Capacitive Touch
Screen**



**Scheduling capability
for Energy
Optimization**



**Centralized Control &
Monitoring through
Web App**



**Integration with
Building Management
System through
BACnet/MQTT**



**Automatic or manual
heating/cooling
changeover**



**Minimum and
maximum limitation of
room temperature
setpoint**



**Built-in Temperature
and Humidity Sensor**



**Customizable to add
additional Air Quality &
Motion Sensors**

System Architecture

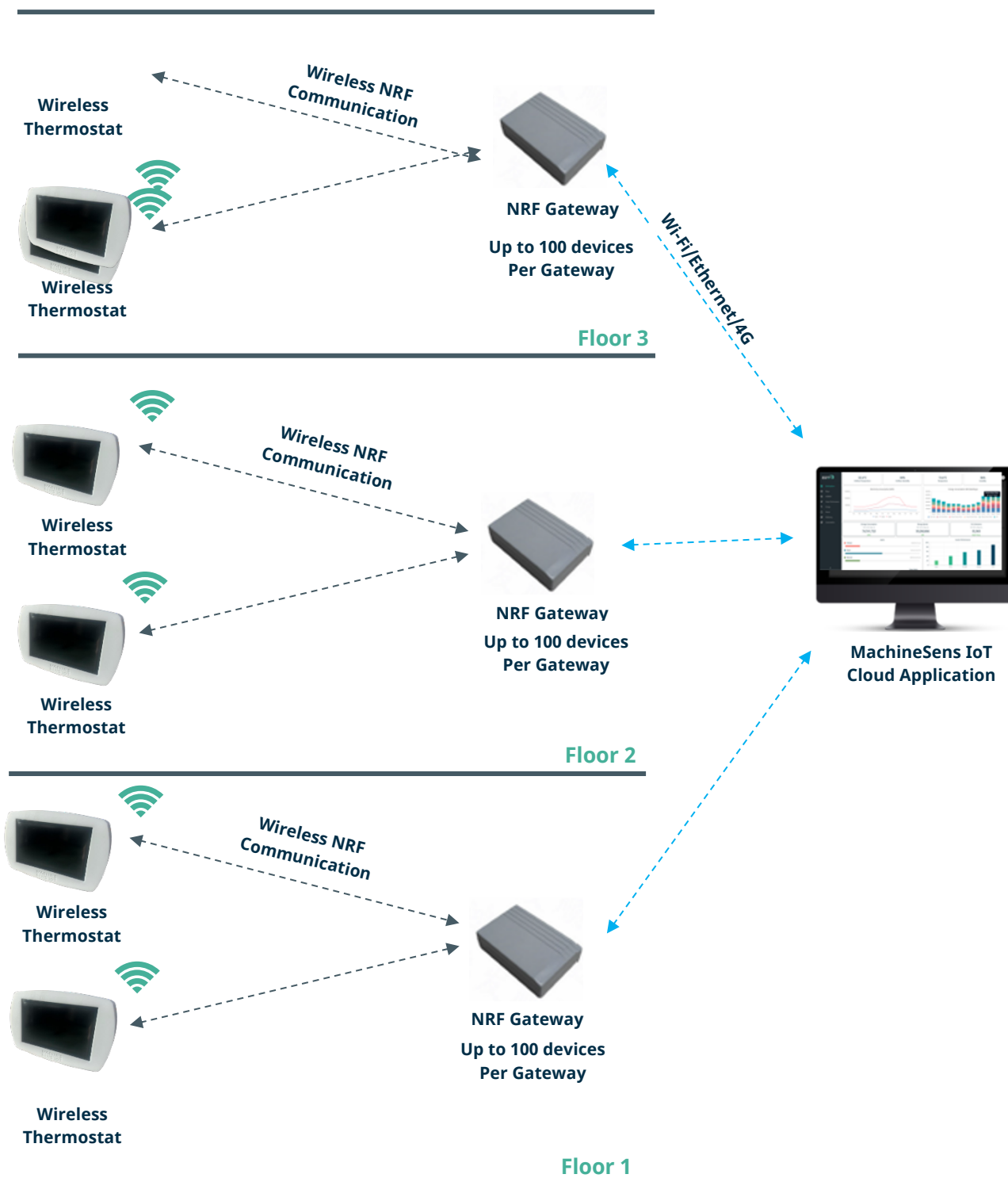
ThermoSense wireless intelligent thermostat leverages advanced NRF technology, ensuring high speed and long-range signal propagation for real-time control and monitoring.

Our smart gateway collects near real-time data from all wireless sensors within range, converts it into an easy-to-use JSON format, and publishes it via the MQTT protocol.

Data can be transmitted to any local or cloud MQTT broker through Ethernet, LTE (4G), or WIFI.



Integration to Building Management System (BMS) can be achieved using MQTT broker or through an external BACnet converter.



ThermoSense wireless intelligent thermostats can be centrally controlled from MachineSens IoT Cloud Platform.

The MachineSens IoT Cloud Platform enables: -

- Monitoring & Control: **ThermoSense** wireless intelligent thermostat enables remote monitoring and control of the AC equipment.
- Data Analysis: IoT devices transmit this data to a cloud based central software system for real-time analysis and notifications.
- Optimal Setpoints: The IoT solution (Hardware + Software) enables automated or centralized control of the Terminal unit's temperature to maintain comfort while minimizing energy consumption.
- Reporting: The system can generate energy usage reports (virtual metering), helping users understand their consumption patterns and make informed decisions.
- Programmed Schedules:
 - Scheduling - Desired schedules can be programmed in the cloud-based software platform for control & monitoring. The IoT system can respond to demand response signals, reducing energy usage during peak periods. Specific times for system operation, such as when the HVAC should start or stop, temperature setting can be enabled or restricted.
 - The FCU and DX units set points and operation can be optimized based on weather conditions.

Specifications

Display	
Display Type	4.3-inch Capacitive Touch Screen
Resolution	480*272 Pixels Resolution
Electrical	
Power Input	230V AC or 24V DC
Operating Voltage	5V DC
Terminal Size	Up to 16 AWG/1.5 mm ² for Power & Relay connections



Sensors and Input	
Sensor Accuracy	Temperature: $\pm 1^{\circ}\text{C}$ Humidity: $\pm 3\%$ RH
Measuring Range	Temperature: -10°C to $+70^{\circ}\text{C}$ Humidity: 0% to 99%
Input (Optional)	1 Universal Input (Analog Input or Dry Contact)
Outputs	4 Digital Outputs (4 Relay*) 1 Relay Valve Outputs (1 Relay*) (*) 5A for resistive loads and 2A for inductive loads
Additional Sensors (Optional)	PIR Sensor for Motion TVOC, Atmospheric Pressure, eCO ₂
General	
Operating temperature	10°C to $+50^{\circ}\text{C}$
Relative Humidity	10% to 90% (non-condensing)
Environment	Indoor
IP Rating	IP30
Temperature Setting	15°C to 40°C
Terminal Connections	Screw Terminals
Mounting	Flush Mounted (Standard EU Box) Surface Mounted
Dimensions (HxWxD)	Flush Mounted: 90 x145 x 34 mm Surface Mounted: 90 x145 x 43 mm
Housing Material	Flame retardant ABS and PLA
Wireless Technology	NRF 2.4 Ghz
Wireless Communication (NRF)	
Protocol	Enhanced ShockBurst (ESB)
Frequency	2.4 Ghz (ISM Band)
Transmit Range	Up to 100m
Operating Voltage	3.3V
Current Consumption	Transmit Mode: Typically, around 115 mA Receive Mode: Typically, around 45 mA Power-Down Mode: Low power consumption when not in use
Output Power (PA)	Adjustable (OdBm, -6dBm, -12dBm, -18dBm)

Receiver Sensitivity (LNA)	Around -85 dBm in 2 Mbps mode. Sensitivity may vary based on the data rate and modulation settings
Data Rates	Selectable data rates (e.g., 250 kbps, 1 Mbps, 2 Mbps)
Interface	SPI (Serial Peripheral Interface) for communication with a microcontroller
Modulation	GFSK (Gaussian Frequency Shift Keying) modulation
Data Format	JSON