



*"This is part of the project that has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723925"*

# SCI-BEMS

## Extended Equipment List Descriptions



HEAT4COOL

Smart building retrofitting complemented by solar assisted heat pumps integrated within a self-correcting intelligent building energy management system

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# 1 GATEWAY

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In order to gather the acquired sensorial data for energy consumption, environmental ecosystem parameters and to provide appliance control where needed, a system gateway, based on the Raspberry platform (Figure 1), will be installed along a Z-wave daughter card. The later will ensure a permanent data transmission directly to the cloud database for further processing. The following information was extracted from the device's manual.

## 1.1 The Raspberry PI 3 Model b+

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- The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV and uses a standard keyboard and mouse.
- The latest addition to the Raspberry Pi family, the Raspberry Pi 3 Model B+ takes the platform to a completely new level with a 1.4GHz 64-bit quad-core processor, dual-band wireless LAN, Bluetooth 4.2/BLE, faster Ethernet, and Power-over-Ethernet support.
- The Raspberry Pi 3 Model B+ is the perfect board for professionals.
- The ultra-low-cost, deck-of-cards sized Linux computer has had a makeover, and it's a good one at that.

### Specifications:

Processor:	Broadcom BCM2837B0, Cortex-A53 (ARMv8) 64-bit, 1.4GHz
RAM Memory:	1GB LPDDR2 SDRAM
Wireless Connectivity:	2.4GHz and 5GHz IEEE 802.11.b/g/n/ac Bluetooth 4.2, BLE
Inputs/Outputs:	Extended 40-pin GPIO header
Ports:	Full-size HDMI USB 2.0 ports CSI camera DSI display 4-pole stereo output Composite video Micro SD port
Power:	5V/2.5A DC power input



Figure 1. Raspberry PI 3 Model B+.

## 1.2 The RaZberry 2 daughter card

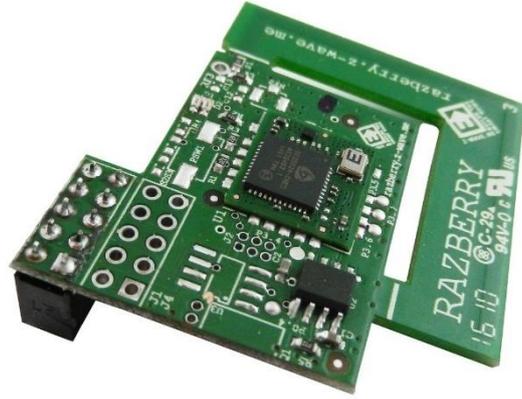
The RaZberry2 turns every Raspberry PI into a Z-Wave Home Automation Gateway (Figure 2). The bundle of hardware and precompiled Z-Wave wireless network management software waits to be completed customising the user interface running in a web browser or a mobile phone. The Z-Wave software offers an easy to understand and easy to use interface, applying the well-known Java Script interface technology JSON on a built-in web server. Writing custom home automation apps was never easier and never more affordable. The RaZberry 2 has an optimized antenna so that this module can now achieve a range of up to 200 meters. The following information was extracted from the device's manual.

The RaZberry consists of four parts:

- Z-Wave transceiver pluggable to the GPIO interface of the Raspberry PI
- Optimized transceiver firmware running on the Z-Wave transceiver chip
- Certified Z-Wave communication stack Z-Way - running on the Raspberry PI and offering a web-based interface
- Z-Way AJAX based demo User Interface for easy access to all Z-Wave functions of Z-Way and as a reference for own User Interface enhancements

### Specifications:

Protocol:	Z-Wave Plus
Frequency:	868.4 MHz
Range:	>40 m in buildings, up to 100 m in free range
Dimensions:	20mm x 40mm, weight is 16gr
Display:	Red LED: Inclusion and Exclusion Mode Green LED: Send Data Indication



*Figure 2. Z-Wave RaZberry 2 PI GPIO daughter card.*

## 2 SENSOR FOR AMBIENT CONDITION AND OCCUPANCY MONITORING

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Capturing environmental conditions such as temperature, humidity, motion etc, can be performed via multi-sensing devices. This enables the real-time monitoring of the environmental quality and hence correlating how the user ecosystem affects their energy consuming behaviour.

### 2.1 Alternative 1: Aeotec MultiSensor 6 – motion sensor; humidity sensor; temperature sensor; luminance sensor; UV sensor; vibration sensor

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#### 2.1.1 General Outlook

Aeotec Multisensor 6 has been crafted to power connected lighting using Z-Wave Plus (Figure 3). It is powered by Aeotec's Gen5 technology. The following information was extracted from the device's manual.

- The Aeon Labs MultiSensor is a routing binary sensor device based on Z-Wave routing slave library V6.51.06.
- Aeotec by Aeon Labs' MultiSensor looks like a motion sensor and it acts like one too. But it's also so much more. Installing this 1 piece of Z-Wave® technology is the same as installing 6 pieces of Z-Wave technology.
- The building control network will immediately understand motion, temperature, humidity, light, Ultraviolet and Vibration readings wherever MultiSensor installed. Those intelligent readings will equate to intelligence automation.
- The Aeon Labs MultiSensor can be powered by battery or by USB with an appropriate adaptor.

#### Specifications:

Power supply:	DC 5V or 2×CR123A batteries, 3V, 1500mAh
Measured temperature range:	-10 to 50°C; Accuracy: ±1°C
Measured humidity range:	20%RH to 90%RH
Accuracy:	±3%RH (at 25°C)
Lighting:	0 LUX to 30000 LUX
Max motion sensitivity:	5 meters
Operational temperature:	0-40°C
Radio protocol:	Z-Wave Plus
Radio frequency:	868,4 MHz
Range:	up to 150m outdoors



Figure 3. Aetec MultiSensor 6.

### 2.1.2 Installation Principles and Steps

The MultiSensor 6 brings its intelligent readings to many locations inside a dwelling. The inbuilt motion sensor uses light and heat readings to determine motion, sudden light and heating changes can impact the sensor's quality of motion readings. As such, the sensor should not be installed in areas of artificial temperature change. Thus, when selecting a location, it should not be placed beside or near air conditioners, humidifiers, and heaters or directly opposite a window with direct sunlight. The MultiSensor 6 is powered by batteries, hence it should not be installed in a location where the temperature can drop below 0°C / 32°F as this is below the batteries' working point. Selecting a location for the sensor also depends on the layout of any area that will be monitored. Whatever the room or area, it needs to fit within the sensor's effective motion sensing range as described in the following diagrams.

For ceiling installation, the MultiSensor 6 can take measurements within a 3x3x6m / 10x9x18ft range (Figure 4). If installing MultiSensor 6 in a corner where the wall meets the ceiling it can take measurements within a 2.5x3.5x5m / 8x11x15ft range.

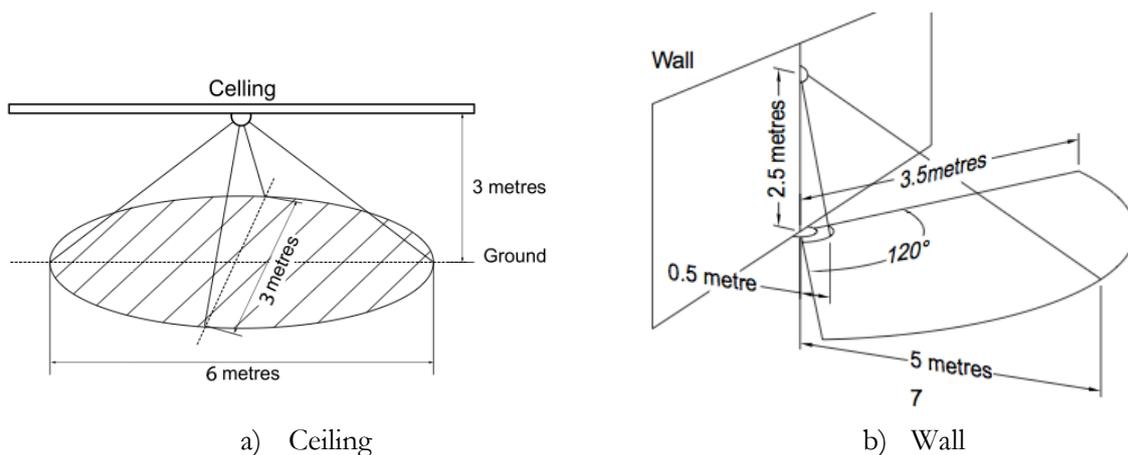


Figure 4. Aetec MultiSensor 6 Installation effective range.

For optimal performance, the MultiSensor 6 should NOT be mounted directly on or near metal framing or other large metallic objects. Large metal objects may weaken the Z-Wave wireless signal. The MultiSensor 6 depends on for communication due to the wireless reflective properties of metal.

#### MultiSensor Installation

With the MultiSensor 6 as a part of the local Z-Wave network and having determined its installation location, the physical installation needs to proceed. There are 2 ways that the MultiSensor 6 can be mounted on a wall or ceiling. Most simply it can be placed upon a shelf without the need to attach further accessories. The technician can mount the sensor in a corner or against a wall or ceiling by using the Back-Mount Plate. It's also possible to embed the MultiSensor 6 within a ceiling or wall using its Recessor accessory.

To install the MultiSensor 6 (Figure 5):

**Step 1:** Using Double-Sided Tape - The surface, on which is planned to be installed Multisensor 6 should adhere to the following conditions: flat, smooth, dry and free of dust and grease.

**Step 2:** Using screws - Initially two holes should be drilled on the desired location on the wall or ceiling. Then the Back-Mount Arm should be fixed using the provided KA2.5×20mm screws.

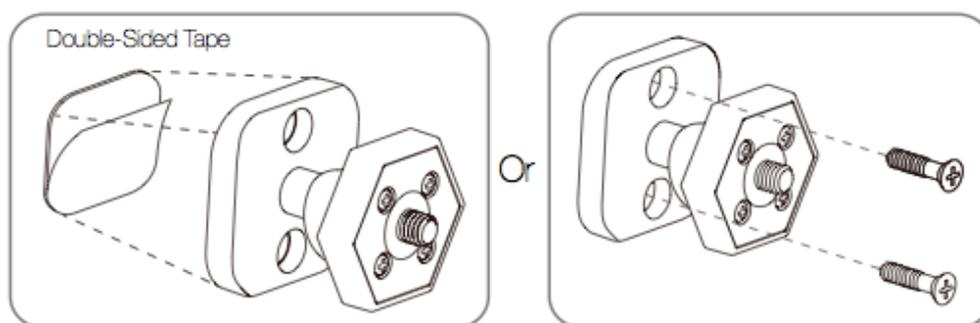


Figure 5. MultiSensor installation.

#### Network configuration

Initially the MultiSensor should be powered on and then use the Z-Wave Gateway to pair Multisensor 6. It should be noted that compatibility and how the sensor shows ultimately

depends on the gateway and software integration of products. To achieve this the following steps should be followed:

1. Put the primary Z-Wave gateway into pair mode, the Z-Wave gateway should confirm that it is waiting to add a new device
2. The Action Button should be pressed on the MultiSensor. The LED on Multisensor will blink Green rapidly, followed by a solid Green LED for 1 second for a successful inclusion, or a solid red LED for 1 second for a failed inclusion.
3. The MultiSensor's successful addition to the Z-Wave network can be tested by pressing its Action Button. The button is pressed and the sensor's green LED is solid for a few seconds, then inclusion has been successful. If the green LED blinks when the button is pressed, the inclusion has been unsuccessful and the steps should be repeated from No 1.

## 2.2 Alternative 2: Fibaro Motion Sensor – motion sensor; temperature sensor; luminance sensor

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FIBARO Motion Sensor is a universal Z-Wave multi-sensor (Figure 6). Along with detecting motion the device measures the temperature and light intensity. The sensor has a built-in accelerometer to detect any tampering of the device. The FIBARO Motion Sensor is battery powered device and designed to be installed quickly and easily on any surface. The LED indicator signals motion, temperature level, operating mode and can be used to see if device is within the Z-Wave network. The Motion Sensor can be used for lighting scenes and presence monitoring systems. The following information was extracted from the device's manual.



Figure 6. Fibaro motion sensor.

### 2.2.1 General Outlook

- Compatible with any Z-Wave Controller.
- Compatible with any Z-Wave or Z-Wave+ Controller (firmware 3.2 or higher).
- Supports protected mode (Z-Wave network security mode) with AES-128 encryption (firmware 3.2 or higher).
- Battery powered.
- Detects motion using a passive IR sensor.
- Measures the temperature.
- Measures the light intensity.
- Easy installation on a wall or any surface.
- Theft and tampering protection – once vibrations are detected, the notification is sent to the main controller.
- Detected movement, temperature and vibrations are signalled by the built-in LED diode.
- Detects vibrations.
- Built-in accelerometer allows to measure orientation in space.

## Specifications:

Power supply:	CR123A battery, 3.0V DC
Recommended installation height:	2.4m
Light intensity measuring range:	0 – 32000lux
Operational temperature:	0°C to 40°C
Measured temperature range:	-20°C to 100°C
Temperature measuring accuracy:	0.5°C (within 0 – 40°C range)
Radio protocol:	Z-Wave Plus
Radio frequency:	868.4 or 869.8MHz EU 908.4 or 916.0MHz US 921.4 or 919.8MHz ANZ 869.0MHz RU
Range:	up to 50m outdoors up to 30m indoors (depending on terrain & building structure)

### 2.2.2 Installation Principles and Steps

FIBARO Motion Sensor has to be installed in a corner of the room or perpendicularly to the doors (Figure 7).

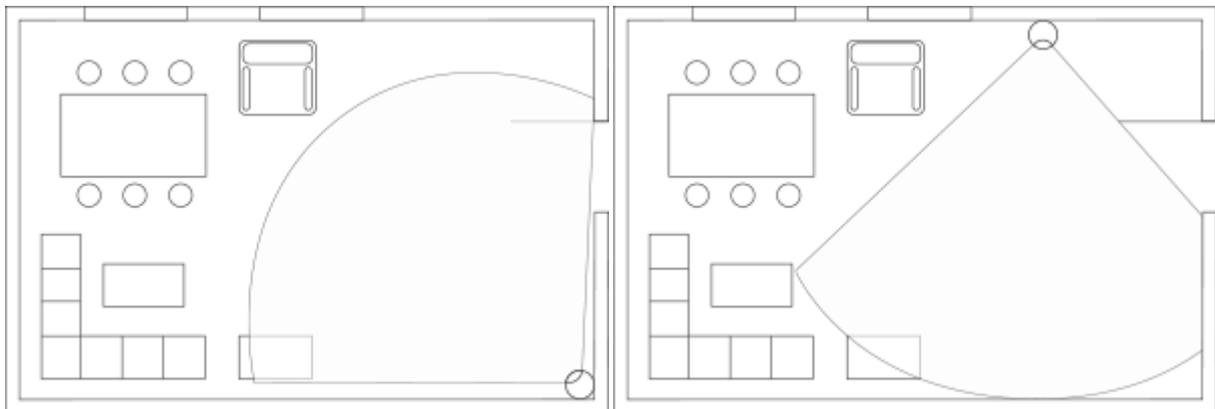


Figure 7. Fibaro motion sensor room locations.

Actual range of the sensor can be influenced by environment conditions. Should false motion alarms be reported, check for any moving objects within the sensor's detection area, such as trees blowing in the wind, cars passing by, windmills. False motion alarms may be caused by moving masses of air and heat as well. If the device keeps on reporting false alarms, despite eliminating all of the above-mentioned factors, install the device in another place.

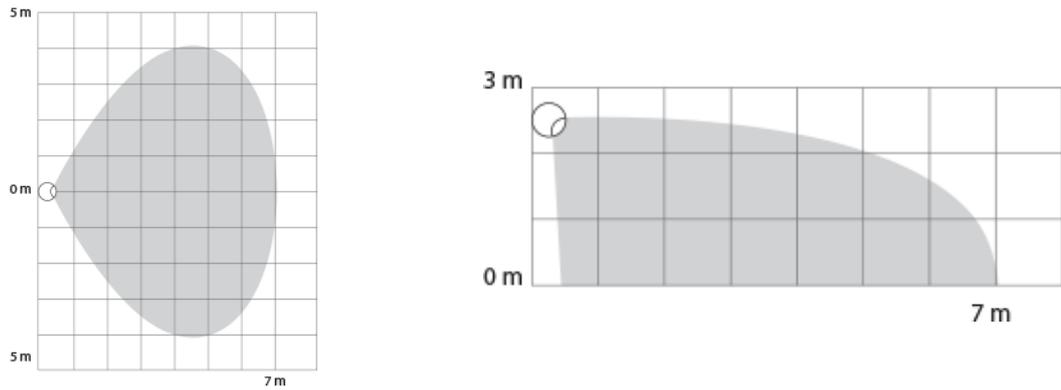


Figure 8. Fibaro motion sensor detection area.



Figure 9. Fibaro motion sensor activation.

### Fibaro motion sensor installation

The Fibaro Motion Sensor cannot be pointed at any source of heat (e.g. radiators, fireplaces, cookers, etc.) or at any source of light (direct sunlight, lamps). It is not recommended to install the Motion Sensor in places prone to drafts and rooms with rapid fluctuations in air temperature. Sensor can be mounted using the included screw or the sticker (Figure 10).



Figure 10. Fibaro motion sensor mounting.

### Sensor Activation

- Open the sensor's casing by turning the cover counter-clockwise. Enclosure lock is marked with a dot.
- Unlock battery by removing "I'm ready" stripe.
- Include the device into the Z-Wave network (see Adding to the network). Note that the inclusion process may be performed ONLY in direct range of the main controller.
- Install the sensor's holder in desired location.
- Insert the Motion Sensor in its holder.
- Test the sensor's operation – check whether the LED diode indicates motion detection.
- Test the Z-Wave network assuring the device is within range.

### *Network configuration*

Initially the Fibaro motion sensor should be powered on and then use the Z-Wave Gateway to pair Fibaro motion sensor. It should be noted that compatibility and how the sensor shows ultimately depends on the gateway and software integration of products. To achieve this the following steps should be followed:

1. The cover should be opened
2. The devices should be powered on
3. The Fibaro motion sensor should be placed within the range of the gateway.
4. By quickly pressing the B-button three times the LED diode will glow blue to confirm setting into learning mode.
5. When the Z-Wave controller is successfully added a confirmation message on the Z-Wave controller will appear

## 3 ENERGY METERING

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### 3.1 Electric Energy Metering

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#### 3.1.1 DIN Rail Metering Devices

##### 3.1.1.1 Qubino 1-Phase Smart Meter

The Qubino Smart Meter is an extremely versatile and powerful Z-Wave device for measuring energy in a single-phase electrical power network of up to 65A (Figure 11). A built-in microprocessor calculates energy, power and power factor from the measured signals. The following information was extracted from the device's manual.



Figure 11. Qubino 1-Phase Smart Meter.

#### General outlook

- It is designed to be mounted on a DIN rail (Figure 12).
- The Qubino Smart Meter can be used in residential, industrial and utility applications.
- It measures energy directly in 2-wire networks by means of fast sampling of voltage and current signals.
- It calculates energy, power and power factor from the measured signals. The device can be controlled through the Z-Wave network.
- It also acts as a repeater in order to improve the range and stability of the Z-Wave network.
- The Smart Meter is designed to be mounted on a DIN rail

#### **Specifications:**

Main terminals	LI, NI, Lo, No
Contacts capacity:	1.5 ... 16 (25)mm <sup>2</sup>
Optional terminals	1, 2, 4, 5
Contact capacity:	0.05 ... 1 (2.5)mm <sup>2</sup>
Type (connection):	single phase (1b)
Reference current (Iref):	5A
Maximum current (Imax):	65A
Minimum current (Imin):	0.25A
Starting current:	20mA
Voltage (Un):	230V (±20%)
Power consumption at Un:	< 2W
Nominal frequency (fn):	50 and 60Hz
Dust/water protection:	IP20
Operating temperature:	-10 ... 40°C

Distance: up to 30 m indoors (depending on building materials)  
 Frequency range: 868.4MHz, Z-Wave Plus  
 Installation: Din rail 35mm  
 Dimensions (WxHxD): 36x90x64mm

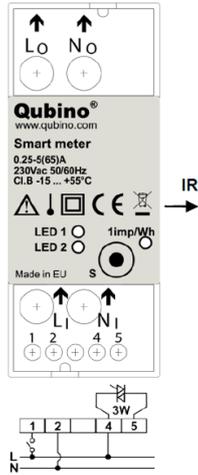


Figure 12. Qubino 1-Phase Smart Meter Terminals.

**Installation Principles and Steps**

The 1-Phase Smart Meter can be used in many different scenes, which can help make life more comfortable. Some installation examples can be seen in Figure 13. Of course, there are countless of other options for how to use the Qubino 1-Phase Smart Meter to remotely control devices via a smartphone.

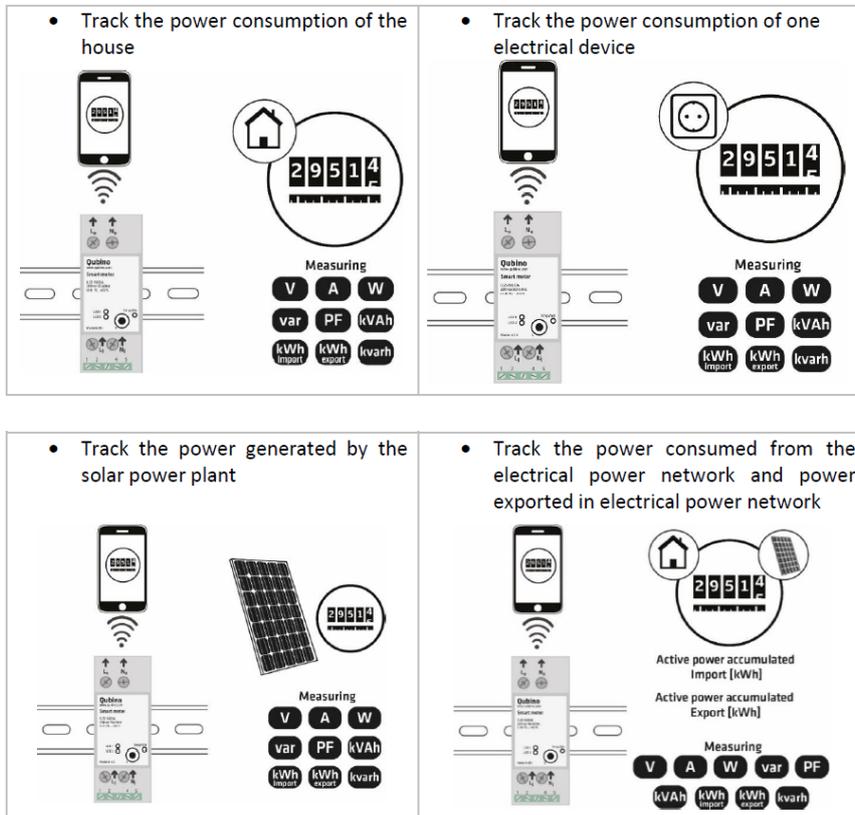


Figure 13. Qubino 1-Phase Smart Meter installation examples.

The installation process, tested and approved by professional electricians, consists of the following simple steps:

**Step 1:** Turn OFF the fuse and:

- To prevent electrical shock and/or equipment damage, disconnect electrical power at the main fuse or circuit breaker before installation and maintenance.
- Be aware that even if the circuit breaker is off, some voltage may remain in the wires — before proceeding with the installation, be sure no voltage is present in the wiring.
- Take extra precautions to avoid accidentally turning the device on during installation.

**Step 2:** Connect the device exactly according to the diagrams shown below. For measuring energy of the house:

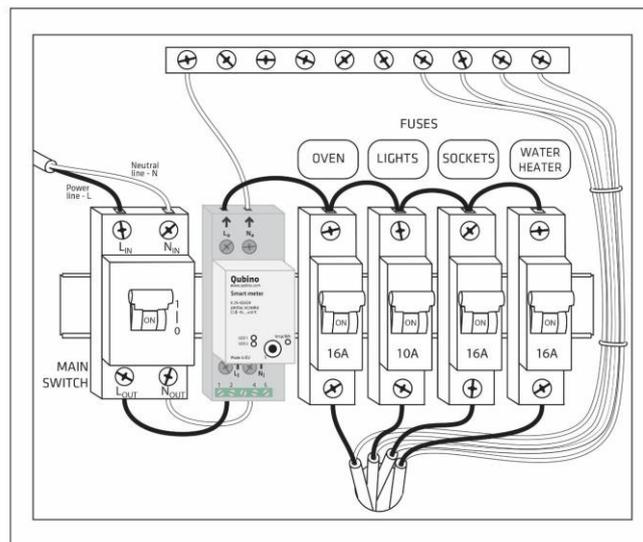


Figure 14. Qubino 1-Phase Smart Meter connection for measuring home energy.

**Step 3:** Turn ON the fuse

*Connecting to the network*

**Automatically adding the device to a z-wave network (auto inclusion)**

1. Enable add/remove mode on the Z-Wave gateway (hub)
2. Automatic selection of secure/unsecure inclusion
3. The device can be automatically added to a Z-Wave network during the first 2 minutes
4. Connect the device to the power supply
5. Auto-inclusion will be initiated within 5 seconds of connection to the power supply and the device will automatically enroll in the network

**Manually adding the device to a z-wave network (manual inclusion)**

1. Connect the device to the power supply
2. Enable add/remove mode on the Z-Wave gateway (hub)
2. Toggle the Service button S between 0.2 and 6 seconds
3. A new multi-channel device will appear on the dashboard

### 3.1.1.2 Qubino 3-Phase Smart Meter

The Smart Meter is an extremely versatile and powerful instrument for measuring energy in a three-phase power network with up to 65A (Figure 15). A built-in microprocessor calculates the reactive energy, the power and the power factor with the measured signals. The Smart Meter is designed so that it can be mounted on a top-hat rail. The following information was extracted from the device's manual.



Figure 15. Qubino 3-Phase Smart Meter.

#### General Outlook

- The Qubino Smart Meter can be used in residential, industrial and commercial facilities (Figure 16).
- It permanently measures the current and the actual voltage directly in a 3-phase network.
- It calculates the current and total power, the power factor PHI and reactive energy which is actually consumed.
- The control via Z-Wave allows separately available relays to be controlled as well as to evaluate the measurement results from the device

#### **Specifications:**

Main terminals	L1I, L2I, L3I, NI, L1O, L2O, L3O, NO
Contacts capacity:	2.5 ... 16 (25)mm <sup>2</sup>
Optional terminals	DI, DO
Contact capacity:	1 ... 2.5mm <sup>2</sup>
Type (connection):	three phase (4u)
Reference current (Iref):	5A
Maximum current (Imax):	65A
Minimum current (Imin):	0.25A
Starting current:	20mA
Voltage (Un):	230V (±20%)
Power consumption at Un:	< 8VA
Nominal frequency (fn):	50 and 60Hz
Dust/water protection:	IP20
Operating temperature:	-10 ... 55°C
Distance:	up to 30m indoors (depending on building materials)
Frequency range:	868.4MHz, Z-Wave Plus
Installation:	Din rail 35mm
Dimensions (WxHxD):	53,6x84x65mm

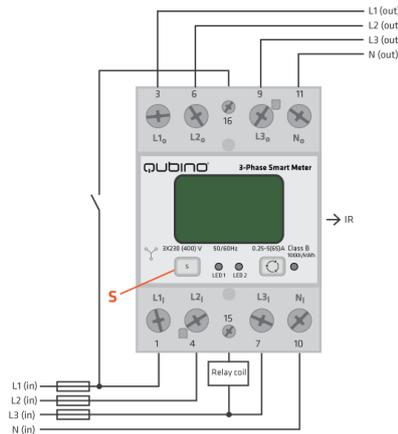
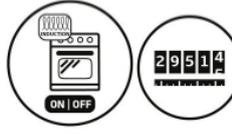
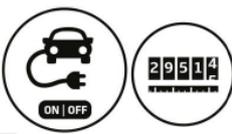


Figure 16. Qubino 3-Phase Smart Meter Terminals.

### Installation Principles and Steps

The 3-Phase Smart Meter can be used in many different scenes, which can help make life more comfortable. Some installation examples can be seen in Figure 17. Of course, there are countless of other options for how to use the Qubino 3-Phase Smart Meter to remotely control devices via a smartphone.

<ul style="list-style-type: none"> <li>Remotely control and measure 3-phase power consumption of one electrical device (for example: heat pump) – with BICOM432-40-WM1</li> </ul>     <p>Measuring</p> <p>V A W var PF</p> <p>kVAh kWh<sub>import</sub> kWh<sub>export</sub> kvarh</p>	<ul style="list-style-type: none"> <li>Remotely control and measure 3-phase power consumption of one electrical device (for example: induction oven) – with BICOM432-40-WM1</li> </ul>     <p>Measuring</p> <p>V A W var PF</p> <p>kVAh kWh<sub>import</sub> kWh<sub>export</sub> kvarh</p>
<ul style="list-style-type: none"> <li>Remotely control and measure 3-phase power consumption of one electrical device (for example: accurate information of electrical car energy consumption) – with BICOM432-40-WM1</li> </ul>     <p>Measuring</p> <p>V A W var PF</p> <p>kVAh kWh<sub>import</sub> kWh<sub>export</sub> kvarh</p>	<ul style="list-style-type: none"> <li>Remotely measure power consumption of whole house and control one group of electrical devices (for example: lights) – with IKA232-20/230V</li> </ul>     <p>Measuring</p> <p>V A W var PF</p> <p>kVAh kWh<sub>import</sub> kWh<sub>export</sub> kvarh</p>

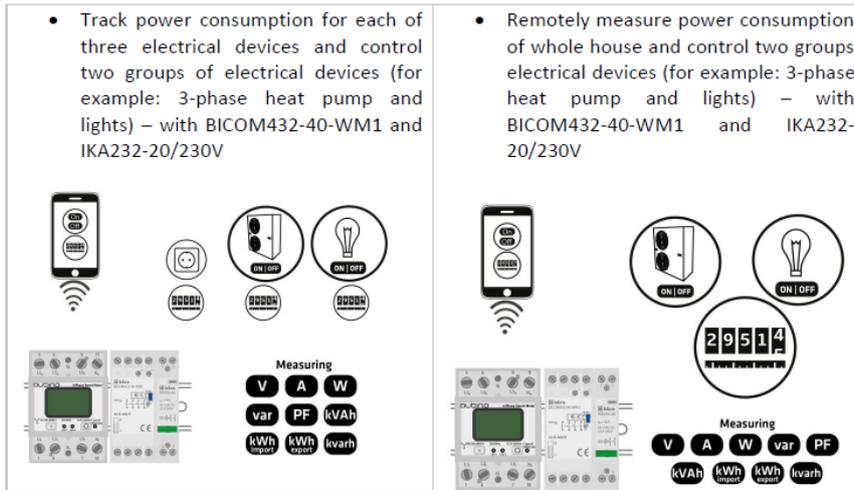


Figure 17. Qubino 3-Phase Smart Meter installation examples.

The installation process, tested and approved by professional electricians, consists of the following simple steps:

**Step 1:** Turn OFF the fuse:

- To prevent electrical shock and/or equipment damage, disconnect electrical power at the main fuse or circuit breaker before installation and maintenance.
- Be aware that even if the circuit breaker is off, some voltage may remain in the wires — before proceeding with the installation, be sure no voltage is present in the wiring.
- Take extra precautions to avoid accidentally turning the device on during installation.

**Step 2:** Installing the device:

- Connect the device exactly according to the diagrams shown below

For measuring the energy of the house:

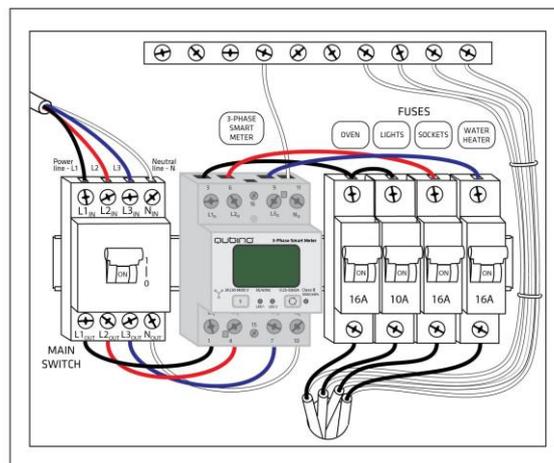


Figure 18. Qubino 3-Phase Smart Meter connection for measuring home energy.

**Step 3:** Turn ON the fuse

*Connecting to the network*

**Automatically adding the device to a z-wave network (auto inclusion)**

1. Enable add/remove mode on the Z-Wave gateway (hub)
2. Automatic selection of secure/unsecure inclusion
3. The device can be automatically added to a Z-Wave network during the first 2 minutes
4. Connect the device to the power supply
5. Auto-inclusion will be initiated within 5 seconds of connection to the power supply and the device will automatically enroll in the network

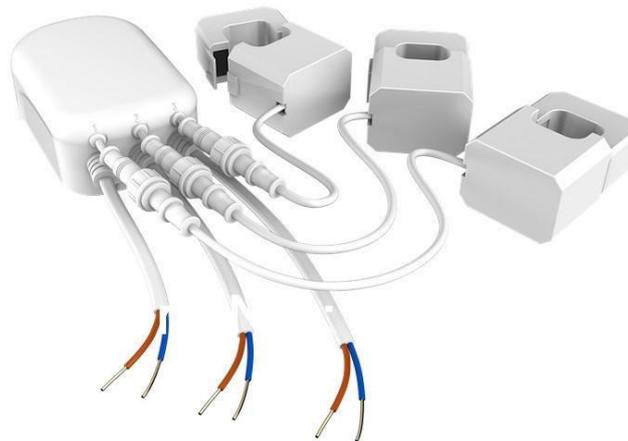
**Manually adding the device to a z-wave network (manual inclusion)**

1. Connect the device to the power supply
2. Enable add/remove mode on the Z-Wave gateway (hub)
2. Toggle the Service button S between 0.2 and 6 seconds
3. A new multi-channel device will appear on the dashboard

### 3.1.2 NON-Intrusive Metering Devices

#### 3.1.2.1 Aeotec Home Energy meter

The Home Energy Meter Gen5 from Aeotec is the easy way to monitor and record all the electricity being used and spent in the entire home and report that data back to the Z-Wave system. It converts the current electricity into something it's not: a tool that provides energy use understanding. Understanding of how much electricity you're really using. Understanding of when energy is used and how to use less and of how to save more. Simply installed, Home Energy Meter Gen5's current clamps affix around the home's AC Mains and record electricity use, wirelessly reporting wattage and kWh electricity usage in real-time. Made for indoor or outdoor use, this electricity monitor is IP43 rated and can operate in most weather conditions. Built using Aeotec's Gen5 and Z-Wave Plus architecture, compared to previous models it offers a superior wireless range necessary for a device that is often installed outdoors or within a metallic current breaker box (Figure 19). The following information was extracted from the device's manual.



*Figure 19. Aeotec Home Energy Meter.*

#### General Outlook

- Keep track of real-time electricity usage with 99% accuracy that reflects how much energy is costing you with this wireless Z-Wave Plus monitor (max 492 feet wireless range).
- Each box comes with 1 monitor and 2 clamps to detect two separate loads, each clamp meters up to 200 amps under 120 voltages.

- The monitor connects to mains power of the 2 phases system in the electricity box, as such a professional electrician may be required for installation.
- Compatible with certified Z-Wave gateways including: Fibaro Home Centre 2, Indigo 7, HomeSeer, Vera, Open Z-Wave, OpenHUB, Zipabox, Qolsys IQ Panel, Home Assistant and more.
- Z-Wave Plus certified for quicker response time, better wireless ranges up to 490 feet in open space, and additional wireless security encryption. Certification number: ZC10-15040002.

### **Specifications:**

Input Voltage:	230V, 50Hz, 10mA
Measure Range of Voltage:	180V-260V
Measure Range of Current:	0A-200A
Measurement Accuracy:	<99%
Operating Humidity:	8%-80%
Operating Temperature:	0°C to 40°C
Operating Distance:	Up to 150m Outdoors
Dimensions:	96x70x230mm
Protocol:	Z-Wave Plus

### **Installation principles and steps**

The installation of the Home Energy Meter has two major parts: the installation of it into the home's main circuit box and the syncing of it to the Z-Wave network. What follows are the instructions for both parts. Please note that only a licensed electrician, with knowledge and understanding of electrical systems and electrical safety, should perform the electrical installation of the meter into the home's circuit box.

**Important:** Only a licensed electrician should perform these steps. The circuit box's main breaker should be turned off to perform these installation steps.

To perform the electrical installation for the Home Energy Meter (HEM), utilize the previous images to determine the phase version of the HEM and to also illustrate the following steps 3 through 7 (Figure 20).

**Step 1:** Turn off the home's main electricity breaker and open the main circuit box panel.

**Step 2:** Connect each clamp to the HEM using the clamp connector and screw them tight.

**Step 3:** Clip the clamps of the HEM around the incoming electricity cables that connect to the main circuit breaker.

**Step 4:** Connect AC Wire to the meter using the AC Wire Connector.

**Step 5:** Insert the HEM's neutral AC Wire into the main circuit breaker's neutral bus terminal.

**Step 6:** Insert the HEM's live AC Wire into the main circuit breakers live terminal.

**Step 7:** Replace the main circuit box panel.

**Step 8:** Turn the main breaker back on.

Within each meter is a low-frequency radio antenna that's used for wireless communication. This must be taken into consideration when selecting a final location for the meter. Thick concrete walls, metals, or motor devices will affect the signal strength of the controller and the meter. If the home's circuit box is made of a metal, it is recommended that the Main Body of the meter be installed outside of the circuit box. Placing the meter inside the circuit box could degrade the quality of the radio signal and negatively impact its wireless range. To assist with

such an installation, each meter is weatherized to the IP44 international standard. This makes it resistant to rain and snow when installed vertically.

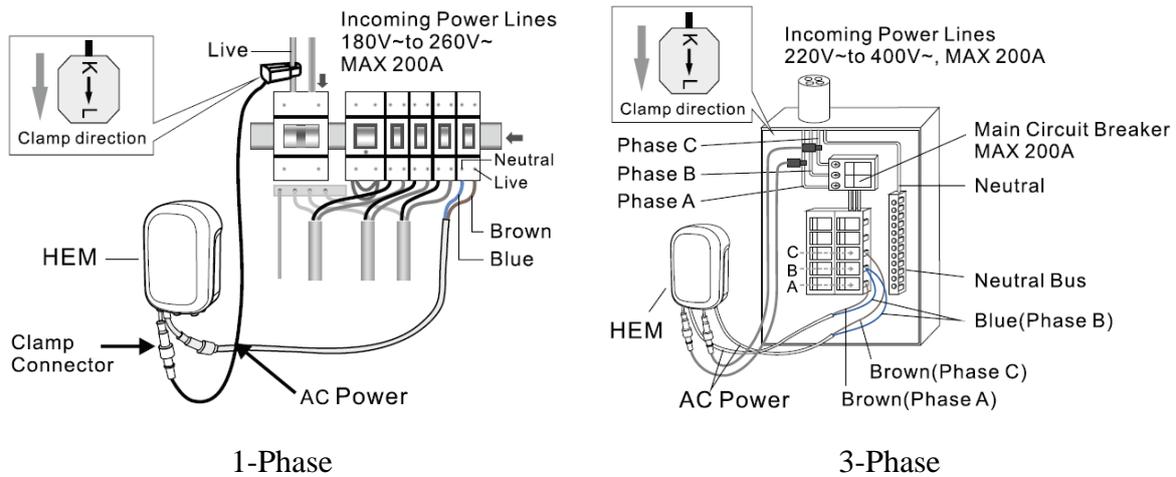


Figure 20. Aetec Home Energy Meter Installation Diagram.

### Connecting to the network

The electrical installation of the Home Energy Meter (HEM) is now complete. The next step is to wirelessly link it to the Z-Wave network.

**Step 1:** Put the primary Z-Wave controller, usually a gateway or hub, into inclusion mode.

**Step 2:** Press the Action Button on the HEM. If it has been successfully linked to the network, its LED will remain illuminated. If the linking was unsuccessful, the HEM's LED will continue to blink.

The installation of the Home Energy Meter is now complete. The next step is to set up the Home Energy Meter within the interface of the primary Z-Wave controller. This will allow to visualize and utilize the energy consumption data that the meter collects. The Home Energy Meter can report wattage energy usage or KWH energy usage to the primary controller. As each controller is different, please refer to the controller's user manual for further information on monitoring and visualizing this data. The Z-Wave commands supporting energy monitoring are the Meter Command Classes.

## 3.2 Aetec Heavy Duty Smart Switch

Heavy Duty Smart Switch is built upon Aetec's smart switch technology. Just like the smart switches, it can be automated, manually controlled, and remotely monitored. Just like the smart switches, it is imbued with Aetec's reliable and accurate power-consumption monitoring technology. Electronics that use up to 40 amps of power. They're the big electronics and appliances in the home. Big fridges and pool pumps. Hot water systems and electric car chargers (Figure 21). The following information was extracted from the device's manual.



Figure 21. Aeotec Heavy Duty Smart Switch.

### 3.2.1 General Outlook

- Secure encrypted wireless technology and repeats Z-Wave
- Remotely turn load on/off
- Report energy usage in watts or kwh
- Bear up to 40 amps current of resistor loads

#### Specifications:

Power Consumption:	1W
Ratings:	240VAC, 50/60Hz, 40A
Radio Range:	150m outdoor
Operational Temperature:	5°C to 40°C
Max Relative Humidity:	80%

### 3.2.2 Installation principles and steps

Before wiring, switch off the air break switch and confirm that the circuit power is down. If the air break switch is out of sight, please lock it to "OFF" position and tag it to prevent unexpected application of power.

**Step 1:** Mount the Heavy Duty Smart Switch on a wall as shown:

**Step 2:** Loosen the Heavy Duty Smart Switch's lower screw to release its shell. Remove the shell to reveal the inner electronics:

**Step 3:** Prepare the wires you will be attaching to the Heavy Duty Smart Switch by stripping them to the necessary length. Add wire terminals to each wire.

**Step 4:** Wire the Heavy Duty Smart Switch according to the following diagram. As shown below, connect each live lines from Air Break Switch to the corresponding terminals marked L1 AND L2 on the Heavy Duty Smart Switch. If there is a Neutral line and GND from the Air Break Switch, please respectively connect them to the terminals labelled N and GND. Similarly, wire the electric load with the Heavy Duty Smart Switch. As a final step, tighten the screws to the wire terminals. (Note: Air Breaker is the same as Circuit Breaker)

**Important:** Make sure the wire terminals are connected firmly with each corresponding terminal on the Heavy Duty Smart Switch. Please pay attention to the power and current of equipment. If the current is less than 32A, you can use AWG10 wire. If the current exceeds 32A, please use AWG8 wire.

**Step 5:** Power on the Heavy Duty Smart Switch. At this stage you need to add it to the Z-Wave network. If you're using an Aeotec Z-Stick or Minimote, please refer the "Z-Wave Network Instructions" section of this user guide. If you're using an alternative gateway, please refer to the respective section of its user manual using the Heavy Duty Smart Switch's Action Button to put it into inclusion mode.

**Step 6:** The product can be mounted on a wall or surface. To do so, drill a  $\varnothing 2.5\text{mm}$  hole that corresponds to the up upper part of the switch. Drill a second hole 138mm directly below then Affix the screws. The installation is now complete.

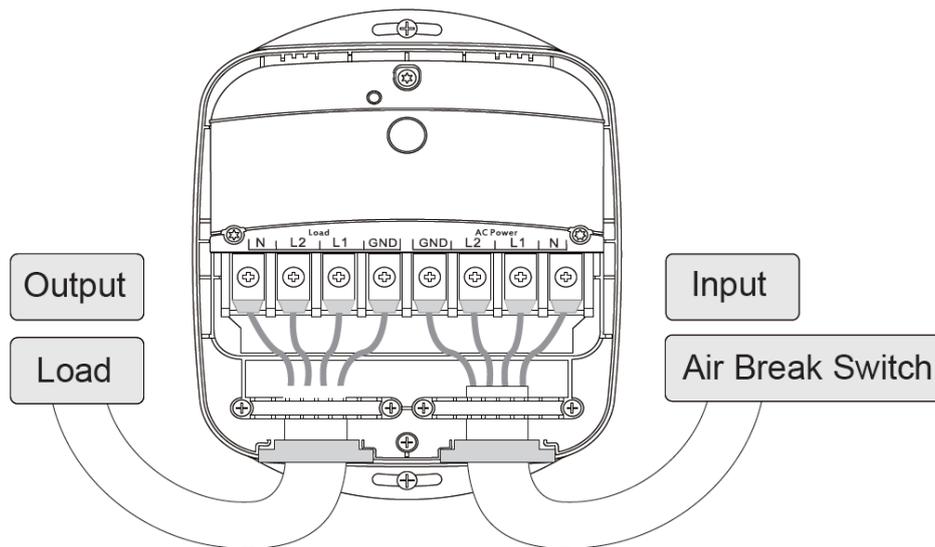


Figure 22. Aeotec Heavy Duty Switch Wiring Diagram.

### Connecting to the network

**Step 1:** Place the gateway or controller into Z-Wave pair or inclusion mode. (Please refer to the controller/gateway manual on how to do this)

**Step 2:** Press the Action Button on the Switch.

**Step 3:** If the switch has been successfully linked to the network, its LED will no longer blink. If linking was unsuccessful, the LED will continue to blink.

## 3.3 Natural Gas Metering

Q-Gas provides a cost-effective solution which helps the users to better understand their gas consumption detected by the gas meters. It is a device that is attached to the gas meter, measures consumption data and monitors it in each user's NorthQ HomeManager account. It is compatible with almost every existing gas meter with a magnetic sensor or silver spot. To use Q-Gas a NorthQ gateway is needed (Q-Stick, Q-Gate, Q-Gate Pro), which provides the connection between Q-Gas and a computer or mobile device by using the HomeManager platform. Through the platform you can easily visualize and optimize the gas consumption (Figure 23). The following information was extracted from the device's manual



Figure 23. NorthQ Q-Gas Meter.

### 3.3.1 General Outlook

- Enables the users to monitor their gas usage remotely
- It can be installed alongside mechanical or electronic gas meters
- Works in any Z-Wave network
- Includes contact sensor to attach to gas meter
- Windows software included to analyse meter readings

#### Specifications:

Operating Humidity:	20%-90%
Operating Temperature:	0°C to 50°C
Operating Distance:	Up to 30m Indoors
Dimensions:	93x75x34mm
Wireless Protocol:	Z-Wave
Frequency:	868.42MHz

### 3.3.2 Installation principles and steps

#### Installation on mechanical meters

**Step 1:** Remove the template from the white background, by gently pulling slip 1 on the left-hand corner of the template and place it correctly on the meter. The horizontal line is flush with the rotation disc, and where the left-hand side vertical line, is aligned with the markings on the middle of the meter. When the template is in place, carefully pull slip 2 in order to remove the middle section of the template. The sensor head should now be placed in the middle of the template, so that the two vertical lines on the template, line up with the same lines that are etched into the surface of the sensor head. Remove the two pieces of red plastic that cover the adhesive pads on the front of the sensor head, and then attach the sensor head onto the meter.

**Step 2:** As the NorthQ Power Reader must be able to work on a wide variety of mechanical meters, a simple automatic meter adjustment is necessary. This is simply done, by pressing the sensor button five times. The LED on the transmitter will then begin to blink rapidly. The LED will begin to blink more slowly as the adjustment is completed. Once the adjustment has been completed, the LED on the wireless transmitter only flashes, when the cursor on the rotating disc passes the sensor-head. In case there are problems with the meter adjustment, try placing the sensor head closer to the rotation disc, or in case of scratches on the front of the meter place the sensor on the side.

#### Installation on electronic meters

**Step 1:** Remove the template from the white background, by gently pulling slip 1 on the left-hand corner of the template. The template should be placed above the LED on the power meter, where the horizontal line and the right-hand-side vertical line cross. When the template

is in place, carefully pull slip 2 in order to remove the middle section of the template. Position the sensor head on the meter. The sensor head should be placed in the middle of the template, so that the two vertical lines on the template, line up with the same lines that are etched into the surface of the sensor head. Remove the two pieces of red plastic that cover the adhesive pads on the front of the sensor head, and then attach the sensor head onto the meter.

**Note:** It is important to carefully place the template correctly, as NorthQ Power Reader won't be able to read the electricity consumption if the template isn't properly positioned!

**Step 2:** Enter the meter's total consumption into the NorthQ Power Reader. Finally, click "Setup complete" to complete installation. Wait approximately 30 minutes before the NorthQ Power Reader will have gathered enough data to begin displaying tables and graphs regarding the electricity consumption. It is possible to immediately read the current-wattage-consumption, in the bottom of the widget, as long as the NorthQ Power Reader is in "Real-time" mode.

### *Connecting to the network*

Insert the USB receiver into an available USB port on the computer. The wireless transmitter can store up to 60 days of measurable data, but remember, it can only transfer data to NorthQ Power Reader, when the USB receiver is inserted. Wait for the USB receiver to be recognized by the computer. - It may take several minutes. Establish the wireless connection by pressing the sensor button on the bottom of the transmitter 3 times. The LED will flash 3 times in response. The message "Transmitter found" will appear on the computer screen. Checking the wireless range: Before installing the transmitter at the meter, check whether the transmitter is within wireless range of the USB receiver. Press the sensor button 4 times when where it is intended to place the wireless transmitter. - The transmitter will blink 4 times in response, to indicate that the wireless range is now being examined. The USB receiver will now try to contact the wireless transmitter, every second, for the next 10 seconds. If the wireless transmitter is within range, the LED light up. The longer the LED shines, the better the wireless signal. if the LED shines constantly for 10 seconds, it means that there's a good connection. If the LED flashes during the test, it means, that there is contact between the transmitter and the receiver, but that you'll experience problems with the connection. If this happens, consider placing the transmitter and the receiver closer together. A long cable between the sensor head and the transmitter enables to position the transmitter wherever the connection is best. If the LED doesn't light up at all, it means that the transmitter is outside the of range of the receiver, and it is necessary to move the transmitter and the receiver closer together. Press "Next", to continue, to instructions, about how to place the sensor head onto the power meter.

## **3.4 Landis & Gyr Ultraheat T330 Meter**

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The extremely compact design of the T330, as well as the rotatable and detachable calculator simplify the installation of the meter and facilitate reading. Even there where is a lack of space, such as for example in narrow meter cabinets or poorly accessible places, the T330 can be used effortlessly. Extended application The T330 can be used in heating or cooling systems with water as heat or cold transfer medium. It is particularly suitable for individual consumption measurement in apartments. Due to the all-metal design of the flow part (measuring unit), it is also used in applications with higher temperatures (105°C) It's always the right meter for all situations. Transport without restrictions The T330 is powered by batteries with low lithium content and is therefore not hazardous goods. The compact packaging saves space in the warehouse and also during shipping. That saves money and reduces emissions (Figure 23). The following information was extracted from the device's manual.



Figure 24. Landis & Gyr T330 Meter.

### 3.4.1 General Outlook

- Non-wearing due to non-moving parts
- Compact, space-saving design
- Robust all-metal measuring section
- Exceptional robust DuraSurface™
- Easy installation and read out
- Fast and intelligent temperature measuring interval
- Large, easy readable display
- Flow measurement with maximum values
- 2 set days per month for 24 months (parameterizable)
- Battery lifetime up to 11 years
- Integrated communication for remote readout or system connection
- Self-diagnosis

#### Specifications:

Temperature Measurement Range:	0°C-180°C
Storage Temperature:	-20°C-60°C
Sensor Type:	Pt500 (2-Wire)
Dimensions:	110x130x190mm

### 3.4.2 Installation principles and steps

To install the meter proceed as follows:

**Step 1:** Determine the place of installation in line with the inscription on the meter.

**Note:** For a heat meter the mounting place of the cold side is equivalent to return and the mounting place hot side is equivalent to flow.

**Note:** For a cooling meter the mounting place of the hot side is equivalent to return and the mounting place of the cold side is equivalent to flow.

**Step 2:** Observe the dimensions of the meter and check whether there is sufficient space available. Rinse the system thoroughly before installing the meter.

**Step 3:** Fit the meter vertically or horizontally between two slide valves so that the arrow on the housing and the flow direction match. Also observe the installation situations and the following examples of installation.

**Step 4:** Fit the temperature sensors in the same circuit as the meter. Observe in addition the admixtures.

**Step 5:** Seal the temperature sensor and the fittings to protect against manipulation. If you install the meter for cooling metering, follow the respective notes.

**Recommendation:** If you are installing several meters, the same installation conditions must be consistent for all meters.

## 3.5 Amber Wireless M-Bus USB Adapter

The AMB8465-M is based on the Wireless M-Bus radio module AMB8425-M providing a plug+play PC communications link via USB interface. The USB adapter operates in 12 channels in the 868 MHz frequency band. The Wireless M-Bus standard (EN13757-4:2005) specifies the communication between water, gas, heat and electricity meters and concentrators. The standard comprises various operating modes (S, T and R) to meet the requirements of one-way and two-way data communication in stationary and mobile systems. By using the USB adapter AMB8465-M, PCs or mobile terminals (such as service terminals) can now easily communicate with wireless M-Bus meters, data concentrators and multi utility control systems (MUCs). The USB adapter fits perfectly as a test + service tool for installations of wireless M-Bus meters or for maintenance work. The integrated microprocessor controls the entire data communication. Data packets are built and transmitted according to EN13757-4:2005. AMB8465-M supports all operating modes according to the Wireless M-Bus specification. The quality of the radio link can be assessed by using the measured field strength (RSSI value). A graphical user interface of the free windows application „AMBER-ACC" allows easy configuration of the operating parameters. (Figure 23). The following information was extracted from the device's manual.



Figure 25. Amber Wireless M-Bus USB Adapter.

### 3.5.1 General Outlook

- Wireless M-Bus interface for PCs and mobile terminals via USB
- Range up to 100 m
- Communication via virtual COM port
- Wireless M-Bus according to EN13757-4:2005 standard
- OMS (Open Metering System) standard supported
- All operating modes (S, T, R) supported
- Easy switching between modes S1, S1m, S2, T1, T2, R2
- Conforms with EU R&TTE 1999/5/EC directive

#### Specifications:

Wireless Range:	100m
RF Data Rate:	2.4 / 16.384 / 66.6 kbps
Frequency Range:	868.95 MHz
Modulation Type:	2-FSK

### 3.5.2 Installation principles and steps

The device is connected either via a virtual COM port or directly via USB using the corresponding software API. The USB controller (FTDI FT232R) supports USB 2.0 (full speed).

## 4 PLUG DEVICES MONITORING AND CONTROL

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Power monitoring will be conducted by using plug in meters which will monitor every day the devices that the occupants will use. Their installation is very simple as they can be plugged in to the existing Schuko type wall plugs and act as a smart plug where the device to be measured can be directly connected to them. These plug-in devices can transmit the consumed energy to the gateway. In this section, three alternative plug-in meters are presented depending on the power load that the connected devices will use.

### 4.1 Alternative 1: Aeotec Smart Switch 6

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Aeotec Smart Switch is a low-cost Z-Wave Switch plugin module specifically used to enable Z-Wave command and control (on/off) of any plug-in tool (Figure 26). It can report immediate wattage consumption or kWh energy usage over a period of time. In the event of power failure, non-volatile memory retains all programmed information relating to the unit's operating status. Its surface has a Smart RGB LED, which can be used for indicating the output load status or strength of the wireless signal. They indication colour can be configured according to the user preferences. The Smart Switch 6 is also a security Z-wave device and supports Over-The-Air (OTA) feature for the products firmware upgrade. The following information was extracted from the device's manual



Figure 26. Aeotec Smart Switch 6.

#### 4.1.1 General Outlook

- Z-Wave Plus smart plug with real-time energy metering and surge protection.
- Wireless on / off control, schedule, and automation of electronics plugged into switch.
- USB port made to charge the smartphone or tablet
- Tested to work with Z-Wave gateways including Fibaro, Home Assistant, Oomi, openHAB, Piper, SmartThings, Vera, and Wink.
- Z-Wave Plus certified.

#### Specifications:

Name:	Smart Switch 6
Model number:	ZW096
Max standby power:	0.8W

Repeater:	Yes
Beaming:	Yes
USB output:	DC 5V±0.3V - 1000mA
Operating temperature:	0°C to 40°C / 32°F to 104°F
Operating humidity:	8% to 80%
Operating distance:	Up to 492 feet / 150 meters outdoors
Minimum energy sensor reading:	2W
Energy reading percentage of error:	Less than 300W ±3W Great or equal to 300W: ±1%
Supported Plug Types:	US: Type B EU: Type E/F  AU: Type I  UK: Type G  Z-Wave Plus
Protocol:	

#### 4.1.2 Installation principles and steps

The installation procedure for the Aeotec Smart Switch 6 is very simple. The user needs to just plug it in to an unused power socket and then plug in on the smart meter any device that needs to be measured.

##### *Connecting to the network*

Getting the Smart Switch up and running is as simple as plugging it into a wall socket and linking it to the Z-Wave network. The following instructions tells how to link the Smart Switch to the Z-Wave network via Aeotec by Aeon Labs' Z-Stick or Minimote controller. When the Smart Switch is plugged into a wall socket and powered on, it can act a repeater in the Z-wave network

## 4.2 Alternative 2: Qubino Smart Plug 16A

The Qubino Smart Plug 16A is ideal for remotely controlling electrical devices and measuring the energy consumption. Without reducing the socket power source, the Smart Plug 16A can handle even the highest consumption devices like convectional electric oven, tumble dryer, washing machine or even multiple devices at once (Figure 27). The following information was extracted from the device's manual.



Figure 27. Qubino Smart Plug 16A.

### 4.2.1 General Outlook

- Remote (via smartphone or PC) and local on/off control of bulbs and electrical appliances such as irons, microwave, fans etc.
- Capable of measuring the power consumption of the connected device in real time via smartphone, which allows savings on electricity bills
- Features one of the easiest and quickest installations of devices
- Saves and restores the last status after a power failure
- Supports auto-inclusion mode for quick set up
- Can be set up anywhere in the house and moved freely, so it can be installed in any room
- Can automatically turn devices on and off after a set period of time
- Supports additional parameters for expert users, which allows for advanced configuration
- Acts as a signal repeater which improves the range and stability of the Z-Wave network
- Can be used to remotely control and trigger other devices in the Z-Wave network

#### Specifications:

Power supply	230 VAC $\pm$ 10% / 50 Hz
Power load	16A resistive max.
Overload protection	> 16A Power consumption
Housing dimensions	43 x 52 x 75 mm
Housing colour	white Weight (ex. packaging)
Z-Wave operation range	up to 30 m indoors (98 ft)
Operating temperature	0 ~ +40°C (32 ~ 104°F)
Plug & Socket type	Socket compatible with type C and F Switching

### 4.2.2 Installation principles and steps

The installation consists of the following simple steps (Figure 28):

**Step 1:** Enable inclusion mode on the gateway

**Step 2:** Insert the Smart Plug 16A device into the socket – the device will be automatically added in the Z-wave network

**Step 3:** Connect the desired load (electrical device) with the Smart Plug 16A

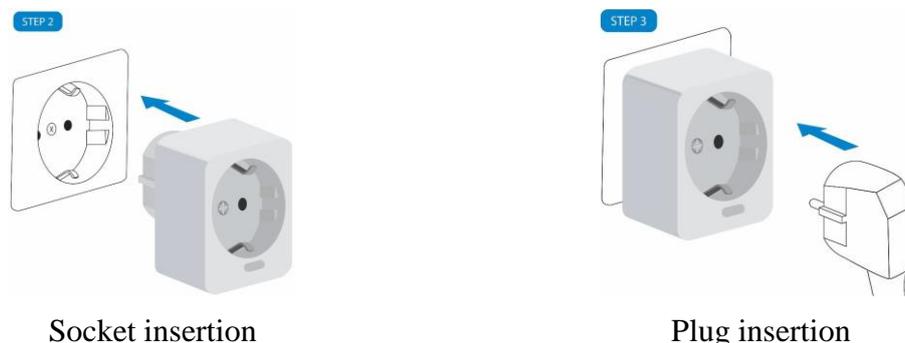


Figure 28. Qubino Smart Plug 16A installation.

#### Connecting to the network

##### Automatically adding the device to a z-wave network (auto inclusion)

1. Enable add/remove mode on the Z-Wave gateway (hub)
2. Connect the device to the power supply

3. Auto-inclusion will be initiated within 5 seconds of connection to the power supply and the device will automatically enrol in the network

#### **Manually adding the device to a z-wave network (manual inclusion)**

1. Enable add/remove mode on the Z-Wave gateway (hub)
2. Connect the device to the power supply
3. Press the Service button S 3 times within 3 seconds
4. A new multi-channel device will appear on the dashboard

### **4.3 Alternative 3: Fibaro Smart Wall Plug**

The Fibaro Wall Plug is a universal, Z-Wave Plus compatible, remotely controlled outlet adapter (Figure 29). This device may be applied wherever it is necessary to control electrical devices with up to 2500W load. The Wall Plug is equipped with a power and energy metering function. It uses a LED ring to visualize the current load with colour changing illumination and operating mode. This is the smallest and most attractive device of this type available in the world. The Wall Plug may be operated using the B-button located on its casing or via any Z-Wave compatible controller. The following information was extracted from the device's manual.



*Figure 29. Fibaro Smart Wall Plug.*

#### **4.3.1 General Outlook**

- Compatible with any Z-Wave or Z-Wave+ Controller
- Supports protected mode (Z-Wave network security mode) with AES-128 encryption
- Extremely easy installation - simply plug the device into the mains socket
- Works as a Z-Wave signal repeater
- Active power and energy consumption metering
- Current value of the load and operating mode are indicated by the multi-colour LED ring

#### **Specifications:**

Power supply:	230V AC, 50/60 Hz
Rated load current (resistive load):	11A - continuous load up to 1.6W
Power consumption:	2.5kW at continuous load
Radio protocol:	Z-Wave Plus
Radio frequency:	868.4 or 869.8 MHz EU
Range:	up to 50m outdoors, up to 40m indoors
Operating temperature:	0 - 40°C
E or F type (Schuko) sockets:	CEE 7/16 (max 2.5A) / CEE 7/17 – (max 11A)

### 4.3.2 Installation principles and steps

The installation consists of the following simple steps (Figure 30):

**Step 1:** Enable inclusion mode on the gateway

**Step 2:** Insert the Smart Plug 16A device into the socket – the device will be automatically added in the Z-wave network

**Step 3:** Connect the desired load (electrical device) with the Smart Plug 16A (Figure 30).



Figure 30. Fibaro Smart Wall Plug installation.

#### *Connecting to the network*

1. Plug the device into a socket nearby the main Z-Wave controller.
2. Set the main controller in (security/non-security) add mode (see the controller's manual).
3. Quickly, triple click the B-button located on the casing.
4. Wait for the device to be added to the system.
5. Successful adding will be confirmed by the controller.
6. Plug a device that needs to be controlled, into the Wall Plug.
7. Test the device by turning it on and off using the B-Button.

## 5 HEATING SYSTEM MONITORING AND CONTROL

MCO Home Thermostats are Z-Wave enabled devices for indoor temperature control. They can be applied to control different heating/cooling systems, such as: heating cable, heating film, water / electrical valve, boiler, fan coil, solar energy controller, heat pump, air ventilation system etc. With various design and complete function, the device will satisfy customer need. The following information was extracted from the device's manual.

### 5.1 MCO Home Fan Coil Thermostat

MCOHome Fan Coil Thermostat (MCOEMH8-FC4) is a Z-Wave enabled device for indoor temperature control (Figure 31). It is mainly applied to a 4-pipe Fan coil system. It can read room temperature and local time, and automatically control fan speed based on the temperature difference. The device is of high reliability and practicability. This product can be included and operated in any Z-Wave network with other Z-Wave certified devices from any other manufacturers. The following information was extracted from the device's manual.



Figure 31. MCO fan coil thermostat.

#### 5.1.1 General Outlook

- Applied to control fan coil of central AC (2 or 4 pipes)
- Tempered glass panel with capacitive buttons
- Clear display with basic control information
- With Cooling, Heating, Ventilation modes
- Intelligent on/off control of 3-speed fan, and electric valve

#### Specifications:

Power Supply:	85~260VAC/ 24VDC
Working Environment :	0~55°C; <95% RH (Non-condensation)
Dimension:	86x86x41mm
Installation:	Flush mounted in 86x86mm junction box
Protocol:	Z-Wave Plus

#### 5.1.2 Installation principles and steps

The thermostat is suggested to be installed indoor, a place with around 1.5m height above the floor where represents the average room temperature. It should be away from direct sunlight, any cover, or any heat source, to avoid false signal for temperature control.

**CAUTION:** Cut off power supply at circuit breaker or fuse before installation to avoid fire, shock or death!

**Step 1:** Remove the steel frame from the device and secure it onto the junction box with two screws (Figure 32).

**Step 2:** Insert all wires into the right terminals and tighten screws. The wiring diagram is shown below (Figure 33).

**Step 3:** Attach the wired device on “A” points of the steel frame as shown first, and then push the whole device into junction box.

**Step 4:** Confirm the device is well mounted, power on and it is ready to operate.

**Note:** CO--Cool Valve Open, CC--Cool Valve Close, HO--Heat Valve Open, HC--Heat Valve Close.

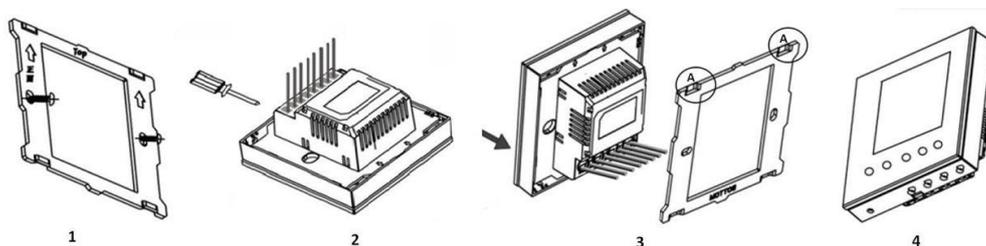


Figure 32: MCO fan coil thermostat installation

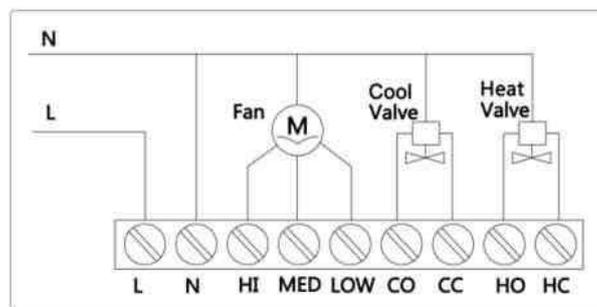


Figure 33. MCO fan coil thermostat wiring.

### Connecting to the network

#### Including & Excluding of Z-Wave network

Under the shutdown state, press & hold  $\nabla$  to enter interface for inclusion or exclusion of Z-Wave network. Before device included into network, “- -” will display on the screen. Then press  $\nabla$  once, device will enter learning mode to get a node ID. If inclusion is success, a node ID will display on the screen in a few seconds. A node ID can always inform us whether the device is in the network or not. Note: Follow the same steps to exclude the device from the network. After inclusion, turn off the device and then turn it on. Now the device is ready to be operated by controller/ gateway in Z-Wave network.

#### Association Group

Thermostat supports 1 association group. A gateway is suggested to associate with this group. Then if any changes happen, such as: temperature, working mode, fan state etc., the thermostat will report to this associated device (gateway). When the detected temperature change  $\geq 0.5^{\circ}\text{C}$ , device will send unsolicited report to the gateway.

## 5.2 MCO Home Heat Pump Thermostat MCOEMH8-FC4

The MH6-HP is mainly applied to control heat pump systems for heating and cooling, with 3 modes easily switchable: Schedule, Hold and Holiday (Figure 34). The device is of high reliability and practicability, and it can support up to 3-stage heat / 2-stage cooling (3H/2C) systems. This device works as a reliable indoor temperature controller. Besides its stable performance, its unique design is also an attractive feature for end users. Moreover, a built-in Z-Wave module makes it a smart device, which can be operated in any Z-Wave network with other Z-Wave certified devices. The following information was extracted from the device's manual.



Figure 34. MCO Heat pump thermostat.

### 5.2.1 General Outlook

- Tempered glass panel with capacitive touch buttons
- Elegant design panel with 4.3" LCD display
- Multi-working modes to meet various user needs:
  - Time Period (Schedule) Mode
  - Hold Mode
  - Holiday Mode
- Individual Programmable Schedule: 4 time periods each day of 7 days, 5+2, 5+1+1
- Compressor time-delayed protection(0-5mins)
- Filter change reminder (max 365 days)
- Built-in Z-Wave module; Optional: RS485, WIFI

### Specifications:

Power supply:	AC24V
Power dissipation	2W
Dimension:	136*94*26mm
Output:	<1A (Resistant load)
Temperature range:	41°F -99°F (5°C -37°C)
Display accuracy:	$\pm 5^{\circ}\text{C}$
Installation dimension:	60mm / 82mm (hole pitch)

Protocol:

Z-Wave Plus

### 5.2.2 Installation principles and steps

**Step 1:** Separate the wall plate from the faceplate by pulling them at A and B, and then insert all wires into the right terminals according to the wiring diagram. Fixed the wall plate into the junction box with M4\*18mm screws (Figure 35).

**Step 2:** Check all the wires, and then evenly push the faceplate into the wall plate till the wall plate and the faceplate fit tightly (Figure 36).

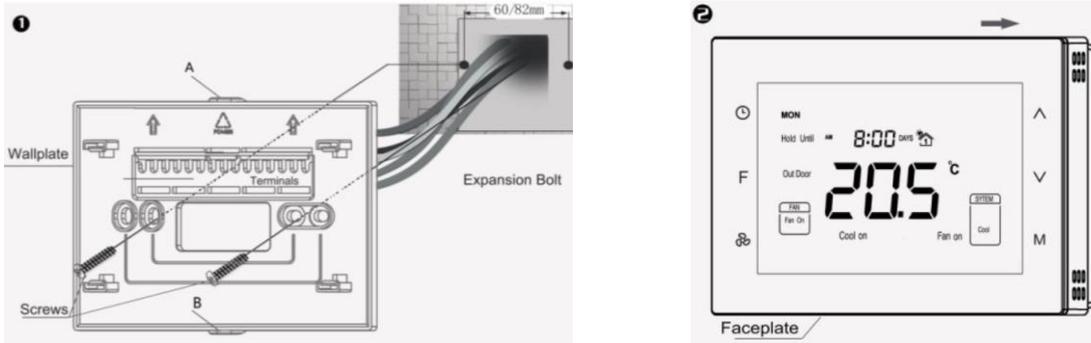


Figure 35: MCO Heat pump thermostat installation

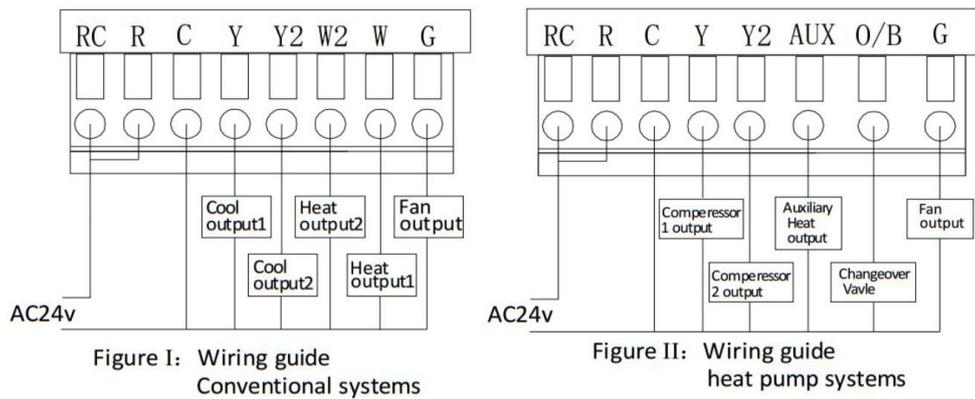


Figure 36. MCO Heat pump thermostat wiring.

#### Connecting to the network

In normal display, press & hold  $\triangle$  to enter interface for inclusion or exclusion of Z-Wave network. Before device included into network, “- - -” will display on the screen. Then press once, device will enter learning mode to get a node ID. If inclusion is success, a node ID will display on the screen in a few seconds. A node ID can always inform us whether the device is in the network or not. After inclusion, press & hold  $\triangle$  will return to normal display. Now the device is ready to be operated by controller/ gateway in Z-Wave network.

**Note:** Follow the same steps to exclude the device from the network.

#### Association Group

Thermostat supports 1 association group. A gateway is suggested to associate with this group. Then if any changes happen, such as: temperature, working mode, fan state etc., the thermostat will report to this associated device (gateway).

## 5.3 Secure SRT323 Room Thermostat

SRT323 is a single-box solution with integrated relay that includes time-proportional integral (TPI) software and interoperable Z-Wave radio. It can be used as a direct replacement for existing thermostats, without the need for wiring changes, while the TPI software optimises boiler firing to help maintain the set temperature without 'overshooting'. TPI controllers have been shown to provide considerable energy savings, compared with traditional heating controllers. The interoperable Z-Wave radio enables you to remotely change the set point, read the temperature or receive alerts. SRT323 is an ideal partner for use with a Z-Wave home gateway for web-enabled apps, allowing remote control of heating from anywhere with an Internet connection. You no longer have to worry about returning to a cold house.

**Note:** this thermostat has a built-in relay, and is therefore not intended to directly associate with a Z-Wave relay via mesh radio. For such applications, our SRT321 should be used. This provides the same functionality, but without a relay, allowing it to be directly associated with a receiver. The following information was extracted from the device's manual.



Figure 37. Secure SRT323 Room Thermostat.

### 5.3.1 General Outlook

- Z-Wave ® mesh radio integration with home control networks
- No wires
- Quick and easy to install
- Compatible with most Z-Wave gateways and receivers
- Z-Wave Thermostat Device Class using Thermostat Setpoint Command Class
- Integrated relay
- No need for external receiver
- Sophisticated time proportional integral (TPI) algorithm
- Improves energy efficiency
- Consistent and accurate control, while minimising temperature overshoot

### Specifications:

Supply:	3V DC (2xAAA alkaline batteries)
Contact Rating:	3A, 230VAC
Operating Temperature:	0°C to 40°C

Dimensions:	86x86x36mm
Signal Range:	100m
Radio Protocol:	868.42MHz
Protocol:	Z-Wave Plus

### 5.3.2 Installation principles and steps

On the rear of the unit in the center there are DIL switches that control TPI and installation mode as described below:

#### Step 1: TPI temperature control software

Thermostats, using TPI (Time Proportional Integral) control algorithms, will reduce the temperature swing that normally occurs when using traditional bellows or thermally operated thermostats. As a consequence, a TPI regulating thermostat will maintain the comfort level far more efficiently than any traditional thermostat. When used with a condensing boiler, the TPI thermostat will help to save energy as the control algorithm allows the boiler to operate in condensing mode more consistently compared to older types of thermostat. DIL switch numbers 2 and 3 should be set as diagram opposite. For Gas boilers set the TPI setting to 6 cycles per hour. (Default setting). For Oil boilers set the TPI setting to 3 cycles per hour. For Electric heating set the TPI setting to 12 cycles per hour.

#### Step 2: Installation Mode

Set DIL switch 1 to 'ON' to enter installation mode. To exit installation mode change DIL switch 1 to 'OFF' (Figure 38).

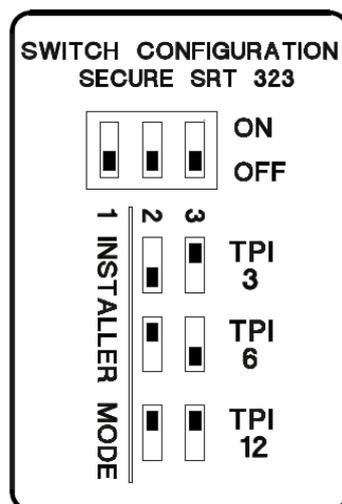


Figure 38. Secure SRT323 Room Thermostat TPI Settings.

#### Connecting to the network

Set DIL switch 1 to 'ON' position on the back of the unit, scroll through the function menu by rotating the dial. To select the required function press the dial. On selecting a function the character will start flashing while waiting for a response from the 3rd party device, a successful response will display a P after the character and a failure will be displayed with an F. If no response has been received from a 3rd party unit within the time-out period, the SRT323 will report a failure.

## 5.4 Secure Temperature Sensor Module

The Secure SES 302 and SES 303 form part of a Z-Wave Plus™ home automation network. The SES 302 measures temperature whilst the SES 303 measures temperature and humidity. The sensors are battery-operated devices which transmit information to an associated device in a network.

The SES 302 and SES 303 are fully compliant Z-Wave Plus™ devices which will work with other manufacturer's Z-Wave devices. (Figure 39). The following information was extracted from the device's manual.



Figure 39. Secure Temperature Sensor Module.

### 5.4.1 General Outlook

- Z-Wave Secure SES302 Temperature Sensors Gen5
- Precise and continuous measuring of temperature
- Supports configurable data reporting
- Supports either one thermistor prob SES 001 or up to four external digital pipe/tank temperature sensors SES 002 / SES 003
- Fixing compatible to British standard single gang wall box
- Battery-operated (two-year life)
- Quick and easy to install and setup
- Z-Wave Plus Certified

### Specifications:

Temperature Accuracy:	±0.5°C for 0°C to 40°C
Power:	2x 1.5 AA Batteries
Dimensions:	85x85x30mm
Operating Temperature:	0°C to 40°C
Wireless Protocol:	Z-Wave
Frequency:	868.42MHz

### 5.4.2 Installation principles and steps

Remove the wall plate from the rear of the SES 302/303.

**Step 1:** The wall plate can be released by pressing the spring clips on the bottom of the wall plate

**Step 2:** While pressing spring clips, swing the wall plate out and down to remove. Choose the position where the unit is to be mounted (Figure 40).

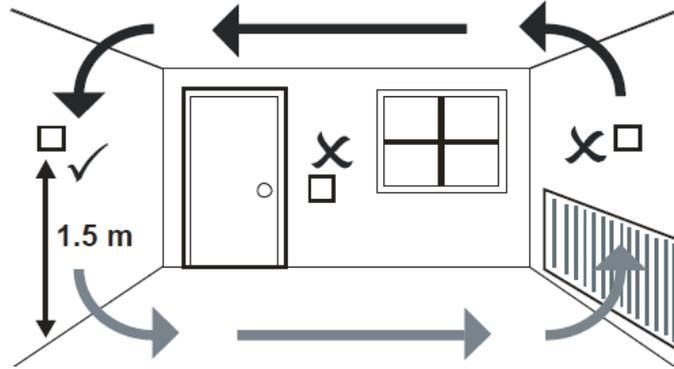


Figure 40. Secure Temperature Sensor Module Mounting Position.

Avoid locations alongside or behind large metal surfaces that could interfere with the low power radio signals between the unit and the controller. The sensor should be mounted on an internal wall, approximately 1.5 metres (5 feet) above floor level and away from draughts, direct heat sources and sunlight. Make sure that there is sufficient space around the unit to allow easy access to the two retaining spring clips on the base of the wall plate. It may be necessary to move the sensor around to ensure good communication. Do not attempt to mount it on the wall until it has been included on the network.

#### Connecting to the network

Association process is applicable only after device included onto network) Please note that some controllers can automatically associate. Always check with the manufacturer's manual.

**Step 1:** Put the controller into Association Mode.

**Step 2:** Press and hold SES 302/ SES 303 button for more than 1 second and then release.

**Step 3:** The controller will confirm association when the process is successfully completed.

## 5.5 Secure Pipe Tank Digital Temperature Sensor

The SES 002 is a wired temperature sensor designed to measure surface temperatures of hot water flow pipes and hot water tanks in central heating applications (Figure 41). The following information was extracted from the device's manual.



Figure 41. Secure Pipe Tank Digital Temperature Sensor.

### 5.5.1 General Outlook

- Z-Wave Secure Pipe Tank Digital Temperature Sensor - 1m Wire
- Measure surface temperature of hot water flow pipes and hot water tanks
- Thermal pad for superior conductivity

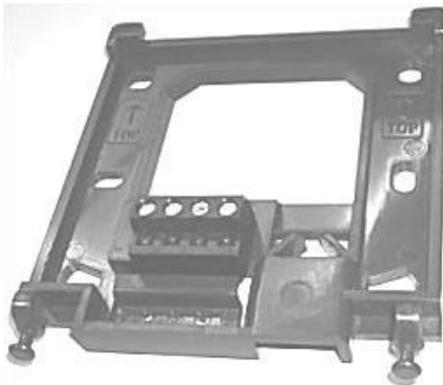
- Digital temp IC for improved accuracy
- Can only be used with SES 302 or SES 303 temperature and humidity sensors
- Easy cascading using RJ10-RJ10 cascade cable (applicable for SES002)
- Up to four external digital temperature sensors are supported by cascading
- Supplied with a 1-metre long communication cable and 1-meter long cascading cable

### Specifications:

Temperature Accuracy:	$\pm 0.5^{\circ}\text{C}$ for $0^{\circ}\text{C}$ to $65^{\circ}\text{C}$ $\pm 1^{\circ}\text{C}$ for $66^{\circ}\text{C}$ to $85^{\circ}\text{C}$
Dimensions:	Pipe Sensor – 20x79x24mm Tank Sensor – 69x83x28mm
Weight:	180 $\pm$ 30g
Operating Temperature:	$0^{\circ}\text{C}$ to $85^{\circ}\text{C}$

### 5.5.2 Installation principles and steps

**Step 1:** Simply remove the back plate by simultaneously pressing the two black push buttons on the bottom and easing it away from the SES 302/SES 303. The back plate has a four-pin electrical connector. The connector block can be removed from the back plate by releasing the locks on the reverse side of the plate. A flat screwdriver will help ease the locks free. Be sure to keep the connector block in a safe place (Figure 42).



Back plate with connector block



Back plate with connector removed

*Figure 42. Secure Pipe Tank Digital Temperature Sensor Back Plate.*

**Step 2:** Use the supplied RJ10 cable with an open end that is packed with the SES 002. Feed the stripped end of the RJ10 cable through the cable guide. Pull through a sufficient working length of cable. The RJ10 telephone cable should now be threaded into the back plate in a safe and secure manner and will not be crushed when the back plate is screwed against the wall. Now insert the stripped copper ends of the RJ10 telephone cable into the connector block. Be careful not to over tighten the screws as this can damage the connector block and the cable. Refer to the picture and connection table (Figure 43).

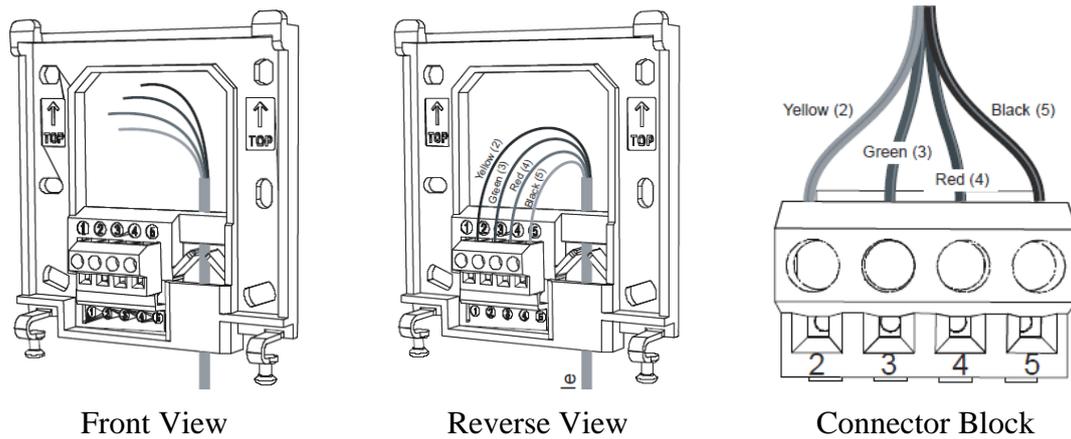


Figure 43. Secure Pipe Tank Digital Temperature Sensor RJ10 connections.

**Step 3:** After establishing good and reliable electrical connection of RJ10 telephone cable with the four-pin black female connector, attach it to the four-pin metallic male connector which is provided on backside of SES 302/SES 303. Keep the RJ10 wire exit in the up direction. Fit the supplied batteries. Now insert RJ10 end of this telephone cable into the pipe/ tank sensor (either socket). The other socket can be used to connect with a second pipe/ tank sensor (daisy chain). The second telephone cable with RJ10 connectors at both ends is supplied for this purpose (Figure 44).

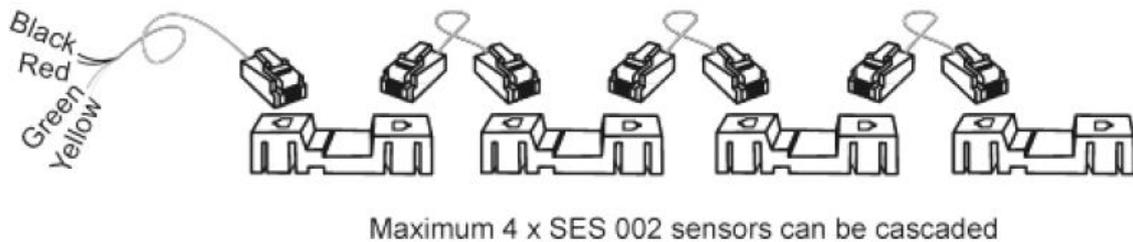


Figure 44. Secure Pipe Tank Digital Temperature Sensor Daisy Chain.

**Step 4:** Up to four pipe or tank sensors can be daisy chained in this manner. Each sensor must have a unique logical address, set in an increasing order from hardware address 1 (e.g. if you have only 2 external sensors these must have address 1 and 2, not 3 & 4, 1 & 3, 2 & 3 or 1 & 4) otherwise the SES 302/ SES 303 will not detect them. The address is set by sliding the side button on each sensor.

#### Connecting to the network

Include SES 302/SES 303 in a Z-Wave network to detect SES 002.

**Note:** If you wish to add a new sensor to an existing Z-Wave network, you will need to Exclude then Include the SES 302/SES 303. This way the new sensor will be detected and included in the Z-Wave network.

## 6 HVAC SYSTEM MONITORING AND CONTROL

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IntesisBox WiFi gateways allow an easy Air Conditioner integration in any kind of control and monitoring system using a simple IP Protocol. New WiFi gateways family is specifically designed for Home Automation Manufacturers or Integrators interested in offering a control solution for the Air Conditioner System, allowing them to create a simple Driver for their Home Hubs controllers. The following information was extracted from the device's manual.

- Does not require cable installation between the Air Conditioner & the Home Controller.
- Easy creation of new Drivers for any Home Controller thanks to the easy IP protocol.
- Control, through the Home Automation system, the responsible of more than 50% of the electricity bill.
- Possibility to auto-discover the WiFi devices installed in the WiFi network.
- Firmware upgrades with new functionalities.
- WiFi configuration allows Dynamic IPs or Static IPs.

### 6.1 IntesisBox DK-RC-WMP-1

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IntesisBox DK-RC-WMP-1 allows a complete and natural integration of Daikin air conditioners into IP based control systems (Figure 45). Compatible with SKY Air and VRV Air Conditioners commercialized by Daikin. The following information was extracted from the device's manual.



Figure 45. IntesisBox DK-RC-WMP-1.

#### 6.1.1 General Outlook

- Control and monitor: On/Off, Mode, Set Temp., Room Temp., Fan Speed, Vane Position.
- Power supply directly from the AC system.
- Does not require cable installation between the Air Conditioner & the Home Controller.
- Easy creation of new drivers for any Home Controller thanks to the easy IP protocol.
- Possibility to auto-discover the WiFi devices installed in the WiFi network.
- Easy installation: Hidden inside the AC unit, on the wall or over the desktop.
- Automatic firmware updates through the configuration tool.
- WiFi configuration allows Dynamic IPs or Static IPs.
- AC unit status and monitoring.

#### Specifications:

Enclosure:	ABS (UL 94 HB). 2,5 mm thickness
Dimensions:	70x108x28mm

Power supply:	14V, 110mA
RF Frequency range:	2412 to 2497 MHz
Operating Temperature:	From 0°C to 40°C
LED indicators	1xDevice status
Mounting:	Wall

### 6.1.2 Installation principles and steps

1. Unplug the Daikin system from mains electricity.
2. Connect IntesisBox device K1 connector to Daikin's Indoor Unit P1P2 connector or Wired Remote Control (if present) (Figure 46).
3. Connect another cable from Daikin's Indoor Unit P1P2 to Daikin's Wired Remote Control connector (if present).
4. Configure the IntesisBox switches (see below).
5. Connect the external antenna into the antenna connector.
6. Place the antenna preferably in a vertical position and pointing directly to the Wi-Fi Router or Access Point (AP).
7. Plug the Daikin system to mains electricity.

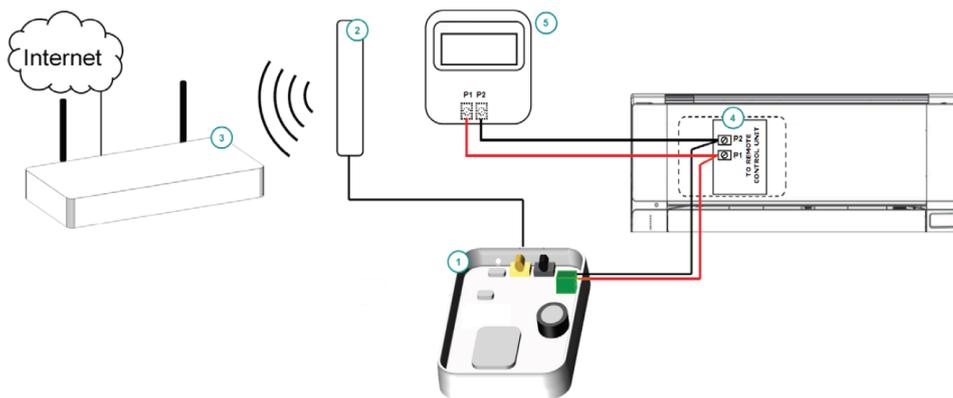


Figure 46. IntesisBox DK-RC-WMP-1 connections.

#### Connecting to the network

**Step 1:** The devices from factory are configured as access point. Once the product is powered on, the network should be visible in the WiFi box list with the SSID name INTESISBOX, and the last 6 digits of the MAC address.

**Step 2:** Connect the PC or mobile to this network and use the following web page to connect the WiFi device to the WiFi network: [wmpconfig.com](http://wmpconfig.com) (Figure 47).

**Note:** in order to connect to the product properly, it is important to be only connected to the product WiFi network. If the PC or mobile has internet connection, it must be deactivated (disconnect ethernet cable, disconnect other WiFi connections, deactivate 3G).



Figure 47. IntesisBox connection options.

If the connection with the WiFi product is not established correctly, the following web page will be shown as a warning. This is a real web page only created for this propose and it means the connection with the product is not established correctly and the network configuration must be rechecked (Figure 48).

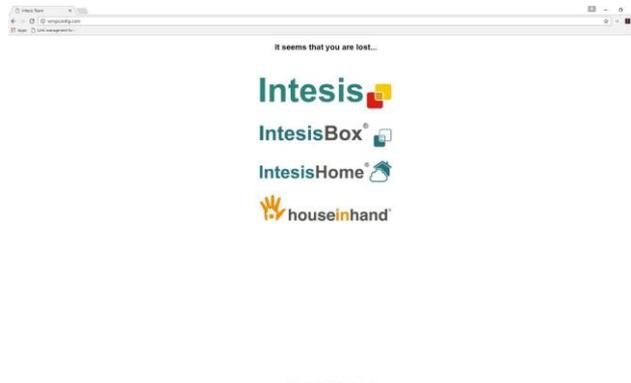


Figure 48. IntesisBox connection page.

By clicking “Tools and Settings” at the bottom of the web page the following window is shown:



Figure 49. IntesisBox configuration confirmation.

When the button “Click to identify the IntesisBox device” is pressed, the LED of the product will start to blink in white color. It is a good way to identify to which device is connected (Figure 49).

On the other hand, the region where the device is allocated can be selected. After saving and applying this setting, the device will be restarted and therefore the connection will be lost. It is then necessary to reconnect to the product again following the previous steps.

## 6.2 IntesisBox FJ-RC-WMP-1

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IntesisBox FJ-RC-WMP-1 allows a complete and natural integration of Fujitsu Air Conditioners into IP based control systems (Figure 45). Compatible with Domestic Air and VRF Air Conditioners commercialized by Fujitsu. The following information was extracted from the device's manual.



Figure 50. IntesisBox FJ-RC-WMP-1.

### 6.2.1 General Outlook

- Control and monitor: On/Off, Mode, Set Temp., Room Temp., Fan Speed, Vane Position.
- Power supply directly from the AC system.
- Does not require cable installation between the Air Conditioner & the Home Controller.
- Easy creation of new drivers for any Home Controller thanks to the easy IP protocol.
- Possibility to auto-discover the WiFi devices installed in the WiFi network.
- Easy installation: Hidden inside the AC unit, on the wall or over the desktop.
- Automatic firmware updates through the configuration tool.
- WiFi configuration allows Dynamic IPs or Static IPs.
- AC unit status and monitoring.

### Specifications:

Enclosure:	ABS (UL 94 HB). 2,5mm thickness
Dimensions:	70x108x28mm
Power supply:	12V, 60mA
RF Frequency range:	2412 to 2497MHz
Operating Temperature:	From 0°C to 40°C
LED indicators	1xDevice status
Mounting:	Wall

### 6.2.2 Installation principles and steps

1. Unplug the AC system from mains electricity.
2. Connect IntesisBox device RWB connector to Fujitsu's Indoor Unit RWB connector or Wired Remote Control (if present).
3. Connect another cable from Fujitsu's Indoor Unit RWB to Fujitsu's Wired Remote Control connector (if present).
4. Configure the IntesisBox switches (see below).
5. Connect the external antenna into the antenna connector.

6. Place the antenna preferably in a vertical position and pointing directly to the Wi-Fi Router or Access Point (AP).
7. Plug the Fujitsu system to mains electricity.

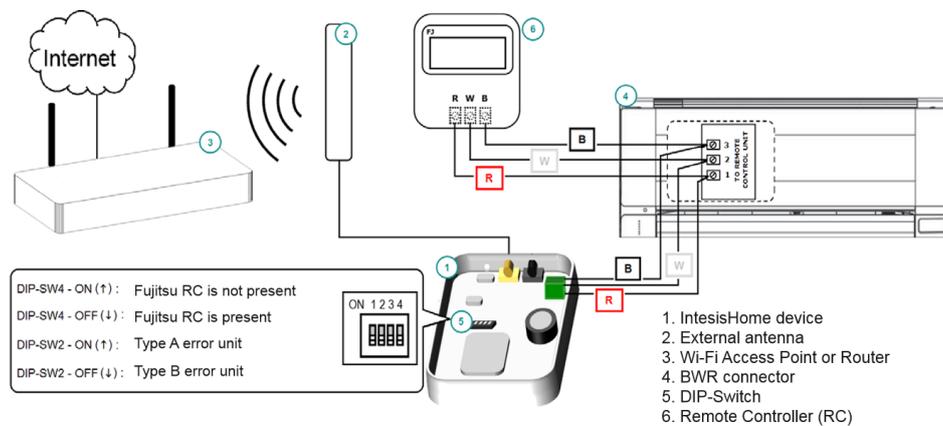


Figure 51. IntesisBox FJ-RC-WMP-1 connections.

### Connecting to the network

**Step 1:** The devices from factory are configured as access point. Once the product is powered on, the network should be visible in the WiFi box list with the SSID name INTESISBOX, and the last 6 digits of the MAC address.

**Step 2:** Connect the PC or mobile to this network and use the following web page to connect the WiFi device to the WiFi network: [wmpconfig.com](http://wmpconfig.com) (Figure 52).

**Note:** in order to connect to the product properly, it is important to be only connected to the product WiFi network. If the PC or mobile has internet connection, it must be deactivated (disconnect ethernet cable, disconnect other WiFi connections, deactivate 3G).

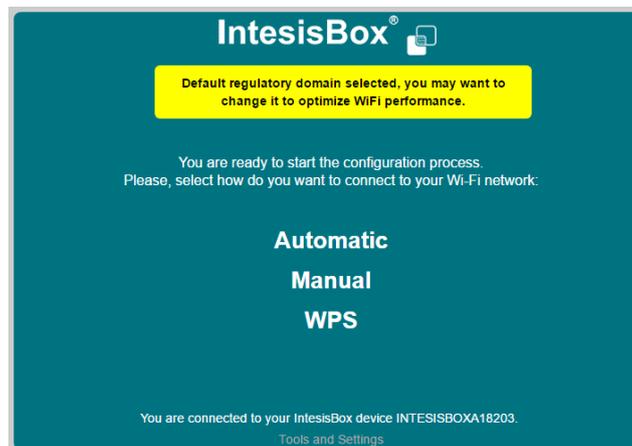


Figure 52. IntesisBox connection options.

If the connection with the WiFi product is not established correctly, the following web page will be shown as a warning. This is a real web page only created for this propose and it means the connection with the product is not established correctly and the network configuration must be rechecked (Figure 53).

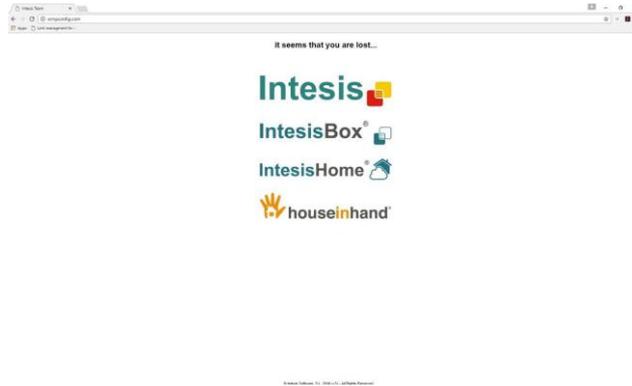


Figure 53. IntesisBox connection page.

By clicking “Tools and Settings” at the bottom of the web page the following window is shown:



Figure 54. IntesisBox configuration confirmation.

When the button “Click to identify the IntesisBox device” is pressed, the LED of the product will start to blink in white colour. It is a good way to identify to which device is connected (Figure 54).

On the other hand, the region where the device is allocated can be selected. After saving and applying this setting, the device will be restarted and therefore the connection will be lost. It is then necessary to reconnect to the product following the previous steps.

### 6.3 IntesisBox IS-IR-WMP-1

IntesisBox IS-IR-WMP-1 interface allows a complete and natural integration of air conditioners into IP based control systems (Figure 55). Compatible with almost all AC units with and IR remote controller receiver. The following information was extracted from the device’s manual.



Figure 55. IntesisBox IS-IR-WMP-1.

### 6.3.1 General Outlook

- Control and monitor: On/Off, Mode, Set Temp., Room Temp., Fan Speed, Vane Position.
- Power supply directly from the AC system1.
- Does not require cable installation between the Air Conditioner & the Home Controller.
- Easy creation of new drivers for any Home Controller thanks to the easy IP protocol.
- Possibility to auto-discover the WiFi devices installed in the WiFi network.
- Easy installation: Hidden inside the AC unit, on the wall or over the desktop.
- Check the installation manual for more information.
- Automatic firmware updates through the configuration tool.
- WiFi configuration allows Dynamic IPs or Static IPs.
- AC unit status and monitoring.

#### Specifications:

Enclosure:	ABS (V-0, 5VB). 2,1mm thickness
Dimensions:	81x78x28mm
Power supply:	5V, 0.2A
RF Frequency range:	2412 to 2497MHz
Operating Temperature:	From 0°C to 40°C
Operating Humidity:	<93% HR, no condensation

### 6.3.2 Installation principles and steps

**Step 1:** Check the IR Universal Controller device location using the Air Conditioner IR remote controller. Make sure that you can control the AC unit properly with the IR remote controller in that location. The IR Universal Controller can be installed on a wall mounted position or in a desktop position.

**IMPORTANT:** Keep in mind that some furniture and materials (carpets, curtains, glass, metal...) may effect on the IR communication.

**Step 2:** Unplug the Air conditioner (AC) unit from the power supply line.

**Step 3:** Power the IR Universal Controller:

a. With the power supply provided along with the IR Universal Controller (Figure 56A).

Socket-outlet shall be near the equipment and shall be accessible.

b. Connected to the 230 V connector of the Air Conditioner Indoor Unit (Figure 56B).

Check the Air Conditioner service manual for detailed information.

**Step 4:** Plug the AC to the power supply line (or the power supply to mains for the IR Universal Controller). If powering of the IR Universal Controller has been successful, the IR Universal Controller LED will start blinking Green and then will change to steady Green.

**NOTE:** Once installation is done, the Wi-Fi and IR configuration can be continued as stated in the corresponding manuals.

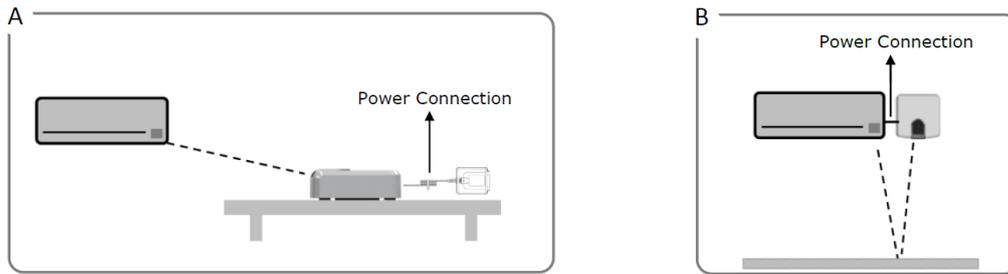


Figure 56. IntesisBox IS-IR-WMP-1 connections.

### Connecting to the network

**Step 1:** The devices from factory are configured as access point. Once the product is powered on, the network should be visible in the WiFi box list with the SSID name INTESISBOX, and the last 6 digits of the MAC address.

**Step 2:** Connect the PC or mobile to this network and use the following web page to connect the WiFi device to the WiFi network: [wmpconfig.com](http://wmpconfig.com) (Figure 57).

**Note:** in order to connect to the product properly, it is important to be only connected to the product WiFi network. If the PC or mobile has internet connection, it must be deactivated (disconnect ethernet cable, disconnect other WiFi connections, deactivate 3G).

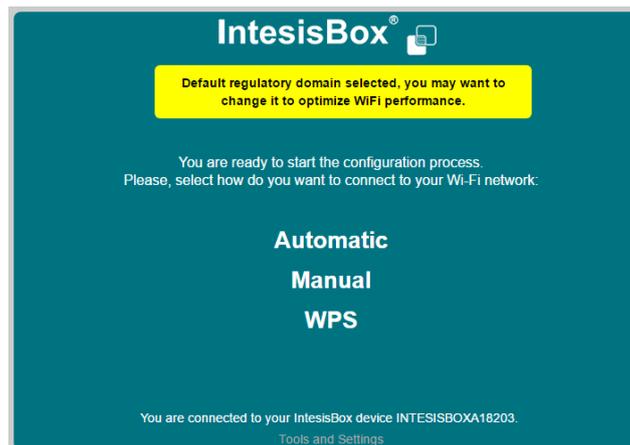


Figure 57. IntesisBox connection options.

If the connection with the WiFi product is not established correctly, the following web page will be shown as a warning. This is a real web page only created for this propose and it means the connection with the product is not established correctly and the network configuration must be rechecked (Figure 58).

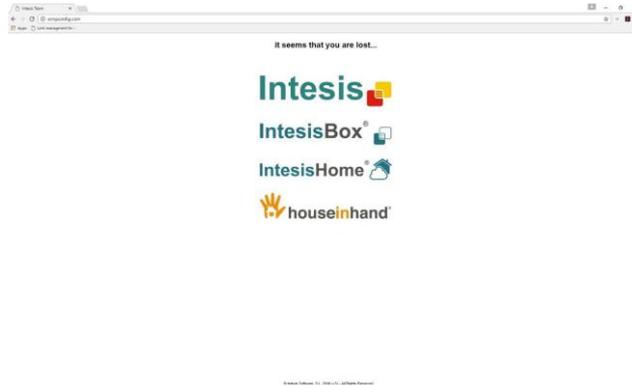


Figure 58. IntesisBox connection page.

By clicking “Tools and Settings” at the bottom of the web page the following window is shown:



Figure 59. IntesisBox configuration confirmation.

When the button “Click to identify the IntesisBox device” is pressed, the LED of the product will start to blink in white colour. It is a good way to identify to which device is connected (Figure 59).

On the other hand, the region where the device is allocated can be selected. After saving and applying this setting, the device will be restarted and therefore the connection will be lost. It is then necessary to reconnect to the product following the previous steps.

## 6.4 IntesisBox MH-RC-WMP-1

IntesisBox MH-RC-WMP-1 interface allows a complete and natural integration of Mitsubishi Heavy Industries air conditioners into IP based control systems. Compatible with RAC Series, FD Series, KX6 and KXR6 (VRF) models commercialized by Mitsubishi Heavy Industries. The following information was extracted from the device’s manual.



Figure 60. IntesisBox MH-RC-WMP-1.

#### 6.4.1 General Outlook

- Control and monitor: On/Off, Mode, Set Temp., Room Temp., Fan Speed, Vane Position.
- Power supply directly from the AC system.
- Does not require cable installation between the Air Conditioner & the Home Controller.
- Easy creation of new drivers for any Home Controller thanks to the easy IP protocol.
- Possibility to auto-discover the WiFi devices installed in the WiFi network.
- Easy installation: Hidden inside the AC unit, on the wall or over the desktop.
- Automatic firmware updates through the configuration tool.
- WiFi configuration allows Dynamic IPs or Static IPs.
- AC unit status and monitoring.

#### Specifications:

Enclosure:	ABS (UL 94 HB). 2,5 mm thickness
Dimensions:	70x108x28mm
Power supply:	14V, 110mA
RF Frequency range:	2412 to 2497 MHz
Operating Temperature:	From 0°C to 40°C
LED indicators	1xDevice status
Mounting:	Wall

#### 6.4.2 Installation principles and steps

**Step 1:** Unplug the AC system from mains electricity & connect the IntesisBox device RWB connector to Fujitsu's Indoor Unit RWB connector or Wired Remote Control (if present).

**Step 2:** Connect another cable from Fujitsu's Indoor Unit RWB to Fujitsu's Wired Remote Control connector (if present) & configure the IntesisBox switches (see below Figure 61).

**Step 3:** Connect the external antenna into the antenna connector & Place the antenna preferably in a vertical position and pointing directly to the Wi-Fi Router or Access Point (AP). When done then plug the Mitsubishi system to mains electricity.

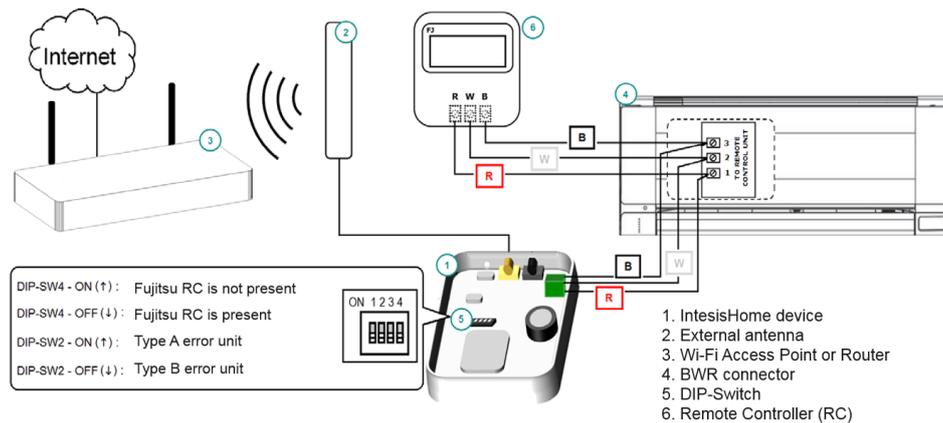


Figure 61. IntesisBox MH-RC-WMP-1 connections.

### Connecting to the network

**Step 1:** The devices from factory are configured as access point. Once the product is powered on, the network should be visible in the WiFi box list with the SSID name INTESISBOX, and the last 6 digits of the MAC address.

**Step 2:** Connect the PC or mobile to this network and use the following web page to connect the WiFi device to the WiFi network: [wmpconfig.com](http://wmpconfig.com) (Figure 62).

**Note:** in order to connect to the product properly, it is important to be only connected to the product WiFi network. If the PC or mobile has internet connection, it must be deactivated (disconnect ethernet cable, disconnect other WiFi connections, deactivate 3G).

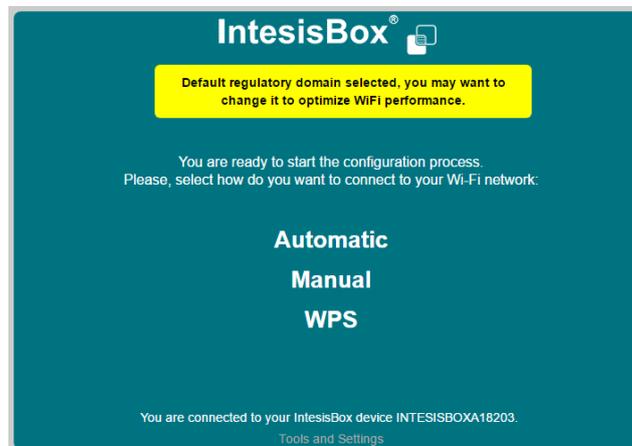


Figure 62. IntesisBox connection options.

If the connection with the WiFi product is not established correctly, the following web page will be shown as a warning. This is a real web page only created for this propose and it means the connection with the product is not established correctly and the network configuration must be rechecked (Figure 63).

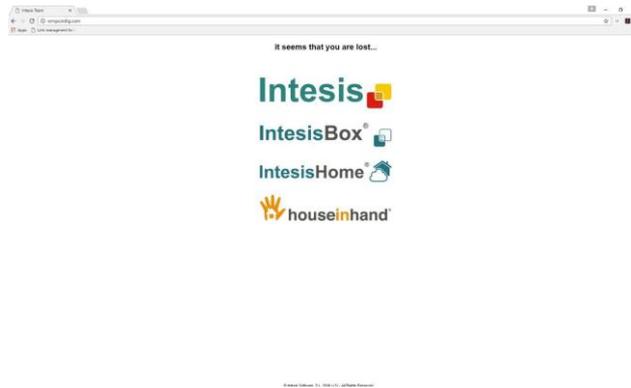


Figure 63. IntesisBox connection page.

By clicking “Tools and Settings” at the bottom of the web page the following window is shown:



Figure 64. IntesisBox configuration confirmation.

When the button “Click to identify the IntesisBox device” is pressed, the LED of the product will start to blink in white colour. It is a good way to identify to which device is connected (Figure 64).

On the other hand, the region where the device is allocated can be selected. After saving and applying this setting, the device will be restarted and therefore the connection will be lost. It is then necessary to reconnect to the product following the previous steps.

## 6.5 IntesisBox IS-IR-WMP-1

IntesisBox IS-IR-WMP-1 interface allows a complete and natural integration of air conditioners into IP based control systems. Compatible with almost all AC units with and IR remote controller receiver. The aim of this integration is to monitor and control the Air Conditioning system, remotely, from the Control Center using any commercial SCADA or monitoring software that includes the possibility to communicate through simple ASCII messages on a TCP/IP network. IntesisBox IS-IR-WMP-1 connects the Air Conditioning system indoor units through infrared communication and on the other side communicates to the TCP/IP network thanks to its WiFi interface. Control the AC unit easily with simple ASCII messages and the IS-IR-WMP-1 InteisBox interface. The following information was extracted from the device’s manual.



Figure 65. IntesisBox MH-RC-WMP-1.

### 6.5.1 General Outlook

- Control and monitor: On/Off, Mode, Set Temp., Room Temp., Fan Speed, Vane Position.
- Power supply directly from the AC system.
- Does not require cable installation between the Air Conditioner & the Home Controller.
- Easy creation of new drivers for any Home Controller thanks to the easy IP protocol.
- Possibility to auto-discover the WiFi devices installed in the WiFi network.
- Easy installation: Hidden inside the AC unit, on the wall or over the desktop.
- Automatic firmware updates through the configuration tool.
- WiFi configuration allows Dynamic IPs or Static IPs.
- AC unit status and monitoring.

### Specifications:

Enclosure:	ABS (UL 94 HB). 2,5 mm thickness
Dimensions:	70x108x28mm
Power supply:	14V, 110mA
RF Frequency range:	2412 to 2497 MHz
Operating Temperature:	From 0°C to 40°C
LED indicators	1xDevice status
Mounting:	Wall

### 6.5.2 Installation principles and steps

**Step 1:** Unplug the AC system from mains electricity & connect the IntesisBox device RWB connector to Fujitsu's Indoor Unit RWB connector or Wired Remote Control (if present).

**Step 2:** Connect another cable from Fujitsu's Indoor Unit RWB to Fujitsu's Wired Remote Control connector (if present) & configure the IntesisBox switches (see below Figure 61).

**Step 3:** Connect the external antenna into the antenna connector & Place the antenna preferably in a vertical position and pointing directly to the Wi-Fi Router or Access Point (AP). When done then plug the Mitsubishi system to mains electricity.

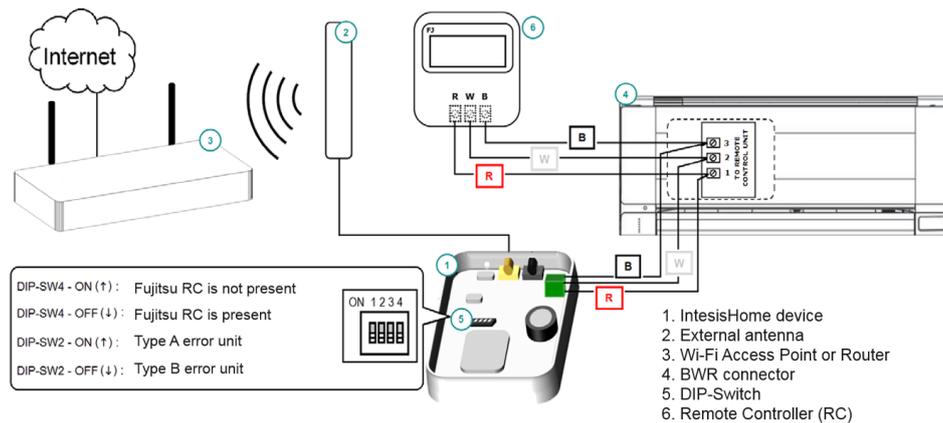


Figure 66. IntesisBox MH-RC-WMP-1 connections.

### Connecting to the network

**Step 1:** The devices from factory are configured as access point. Once the product is powered on, the network should be visible in the WiFi box list with the SSID name INTESISBOX, and the last 6 digits of the MAC address.

**Step 2:** Connect the PC or mobile to this network and use the following web page to connect the WiFi device to the WiFi network: [wmpconfig.com](http://wmpconfig.com) (Figure 62).

**Note:** in order to connect to the product properly, it is important to be only connected to the product WiFi network. If the PC or mobile has internet connection, it must be deactivated (disconnect ethernet cable, disconnect other WiFi connections, deactivate 3G).

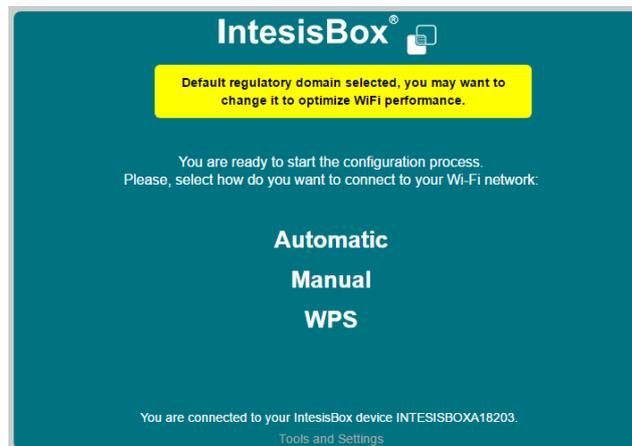


Figure 67. IntesisBox connection options.

If the connection with the WiFi product is not established correctly, the following web page will be shown as a warning. This is a real web page only created for this propose and it means the connection with the product is not established correctly and the network configuration must be rechecked (Figure 63).

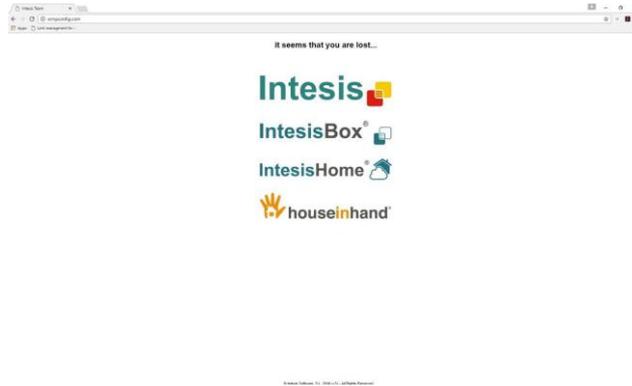


Figure 68. IntesisBox connection page.

By clicking “Tools and Settings” at the bottom of the web page the following window is shown:



Figure 69. IntesisBox configuration confirmation.

When the button “Click to identify the IntesisBox device” is pressed, the LED of the product will start to blink in white colour. It is a good way to identify to which device is connected (Figure 64).

On the other hand, the region where the device is allocated can be selected. After saving and applying this setting, the device will be restarted and therefore the connection will be lost. It is then necessary to reconnect to the product following the previous steps.