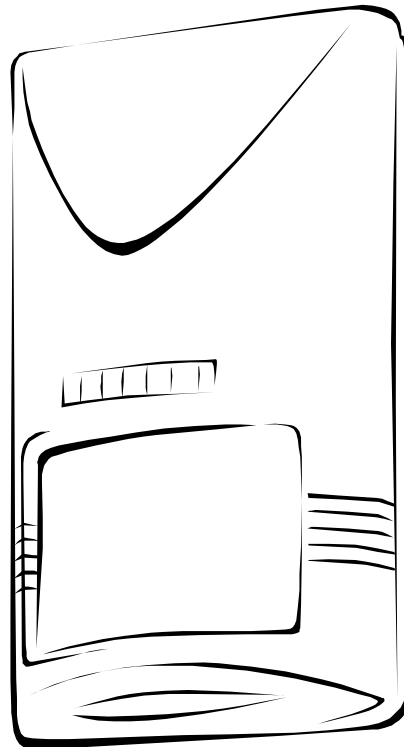




HEM-550

HVAC Energy Management System



INSTALLATION INSTRUCTIONS

To ensure optimum performance of the system, please read all the instructions carefully before installing. Improper installation or setup may result in an inferior performance.

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1. General

INTRODUCTION

The HEM-550 HVAC Energy Management System is designed to provide automatic operation control of HVAC (Heater, Ventilation and Air Conditioner) unit of hotel guestroom according to the occupancy of the room.

By utilizing the proven passive infrared (PIR) sensing technology and intelligent logic control software, the HEM-550 system is able to verify the actual occupancy of guestroom. When guestroom is physically occupied, the HEM-550 system will allow guest to operate and control the HVAC system of the room as usual. Once the guestroom is vacant, the HEM-550 system will automatically shut off the HVAC to reduce the energy consumption and equipment wear.

CAUTIONS

- The HEM-550 contains sensitive electronic components, please handle with extra care.
- Handle by the terminal block or circuit board edges only. Do NOT touch the leads or surface of electronic components to prevent electrostatic discharge damaging the unit.
- Do NOT touch the surface of infrared sensor (the component with square dark window).
- Do NOT attempt to adjust or repair the Master Sensor/Controller. Unauthorized engineering work will void the warranty.

WARNINGS

- HVAC units may contain AC mains power of 110 VAC, 230 VAC or 277 VAC. To prevent electric shock, ensure that AC mains power is disconnected before connecting the HEM-550 system with HVAC units.
- All electrical connections and wirings MUST conform to the National Electrical Code and applicable local codes.
- The HEM-550 system should be handled and installed by qualified electrical service personnel only.
- Do NOT take shortcuts when connecting the HVAC power circuits.

MAINTENANCE

The HEM-550 system requires very little maintenance. End-user's maintenance is limited to the cleaning of dust on front lens surface on the sensor. If any abnormal or faulty condition is happened, call the installer for local service.

2. System Components

2.1 Standard components

1. HEM-550 Master Sensor/Controller

HEM-550 is the master sensor/controller of HEM system. It consists of a high sensitivity passive infrared (PIR) motion sensor and sophisticated microprocessor with intelligent logic control software in an aesthetically pleasing housing. It should be mounted on the wall (corner mount recommended) to detect the presence of human by sensing the movement of body heat energy. In addition to the guest presence detection and verification, the HEM-550 also provides various operation settings and component connections of the system.

To avoid the room becoming too hot or too cold during unoccupied period, thus requires excessive time and energy to cool down or warm up, the HEM-550 also features a programmable secondary thermostat with various high and low temperature limit settings. The HVAC will be activated if room temperature exceeds the set range.

2. DS-100 Door Switch

The DS-100 is a door switch to be recess mounted on the frame of entry door. It should be wired to the corresponding terminals of HEM-550 Master Sensor/Controller to report the open/closed status of the door. Once the door is opened, the HEM-550 system will enter into "standby" mode to detect the guest presence. If motion is detected, the HEM-550 will verify the room as "occupied" status and allow guest to operate the thermostat and set the temperature of HVAC unit by themselves. If no motion is detected within a period of time, then HEM-550 will verify the room "vacant" and then shut off the HVAC operation.

Note: The HEM-550 system will automatically shut off the HVAC operation if any sensor connected door or window is left open for more than 5 minutes.

3. PP-116/PP-216 Power Pack

The PP-116 and PP-216 are two models of power pack for different voltage AC mains power. This power pack not only provides 24 VDC power supply for HEM-550, but also controls the operation of HVAC unit. The HEM-550 system has a fail-safe design. In case that HEM-550 Master Sensor/Controller is malfunction, the HVAC unit can still be operated manually as without using the HEM-550 system.

2.2 Optional components

1 DS-120 Window Switch (optional)

The DS-120 is a pair of magnetic contact to verify open/closed status of window or sliding door to the balcony or patio. This optional switch can be connected to the same

terminal blocks in the HEM-550 as DS-100 in parallel. The HEM-550 system will shut off the HVAC if any connected door/window is left open for more than 5 minutes.

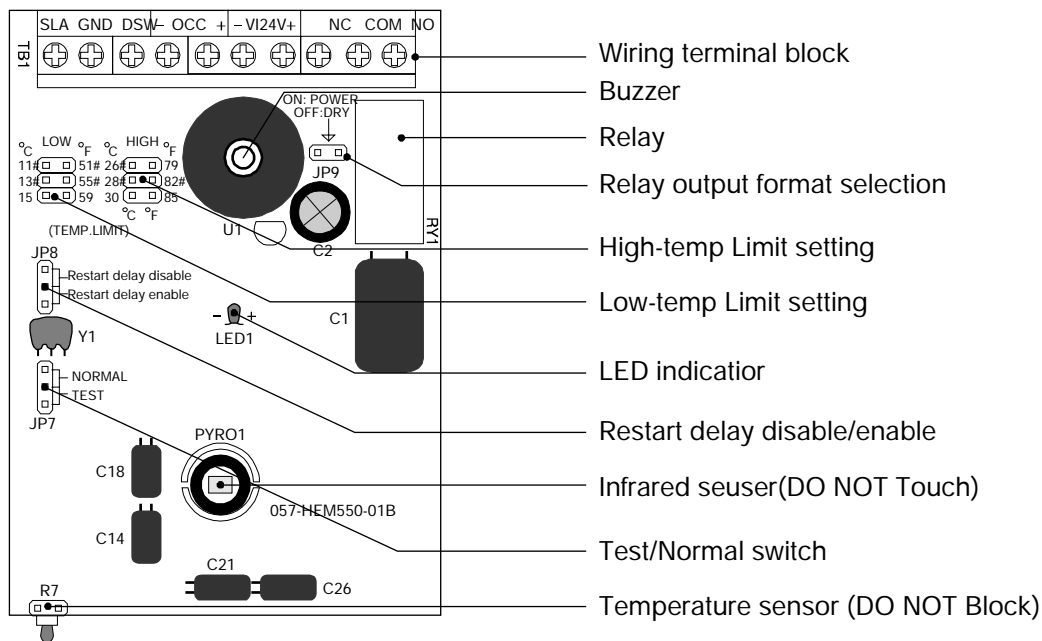
2. OS-550/OS-550T Slave Sensor (optional)

The OS-550 and OS-550T are optional occupancy sensors designed for the additional rooms of hotel suites. The OS-550 contains no temperature sensor and OS-550T contains a temperature sensor. All slave sensors should be connected to the corresponding terminals of HEM-550 Master Sensor/Controller in parallel. They are operated by the power supply from HEM-550, and reports occupancy status of the additional rooms to the HEM-550 Master Sensor/Controller. If any additional room is occupied, the HEM-550 will activate the HVAC unit of the suite.

If the HVAC unit of the additional room is an independent system, the OS-550 or OS-550T can also work as an independent HVAC control system together with PP-116 or PP-216.

3. Description & Configuration

3.1 HEM-550 Description



3.2 Jumper Setting

1. Low temperature limit

This jumper allows the selection of 3 different low temperature limits in which the HEM-550 system will automatically operate the HVAC when room temperature is lower than the set value. The sensor detects the room temperature once every 5 minutes. To disable the low temperature limit, remove the jumper. This function will only operate when room is unoccupied.

2. High temperature limit

This jumper allows the selection of 3 different temperature limits in which the HEM-550 system will automatically operate the HVAC when room temperature is higher than the set value. The sensor detects the room temperature once every 5 minutes. To disable the high temperature limit, remove the jumper. This function will only operate when room is unoccupied.

3. Relay output format

This jumper allows the selection of relay output format. Place the jumper on both pins will make the relay contact with 24V power. If dry contact (no load) output is required, remove the jumper off the pins (disconnect the pins).

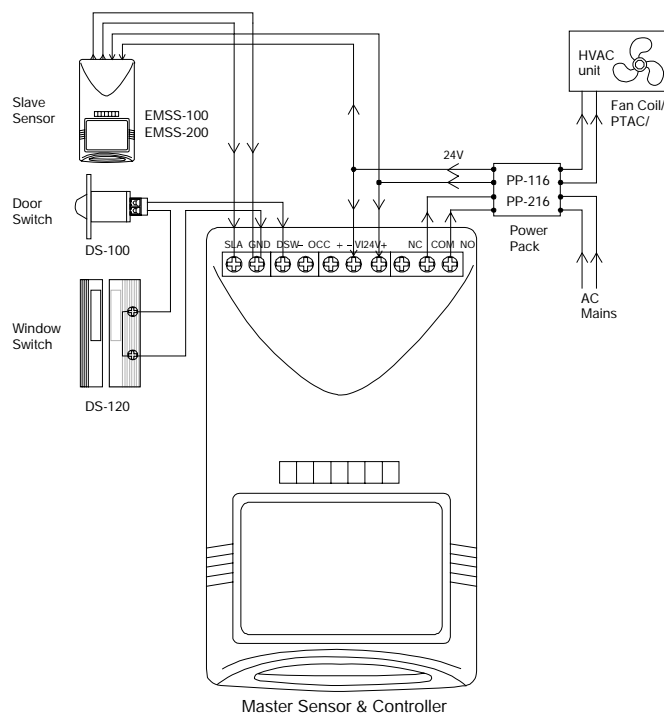
4. Restart delay enable/disable

This jumper allows to enable/disable the 2-minute short start cycle protection. With this restart delay enabled, the HVAC will start operating after 2 minutes. This restart delay is generally required by the individual Packaged Terminal Air Conditioner (PTAC) unit to protect the compressor damaging from frequent activations. To disable short start protection, place the jumper at disable position.

5. Test/normal

This jumper allows to enable/disable the LED and buzzer indication. When jumper is placed at "TEST" position, the LED will light for approximately 2 seconds whenever the motion is detected and the buzzer will beep. If jumper is placed at "NORMAL" position, the LED will NOT light when sensor detects the motion. But it will blink about 10 seconds after the HEM-550 activate the HVAC. This indication will help the maintenance staff to check if the HEM-550 system is working normal.

3.2 Typical System Configuration



4. Installation Instructions

4.1 HVAC System Introduction

The typical HVAC systems used in today's hotel/motel rooms are generally one of the following two types:

Type A: Individually Packaged Terminal Air Conditioner (PTAC)

The PTAC is commonly known as "through-the-wall" HVAC unit. The PTAC types are electrically operated by various AC mains and contain the guest operated setting and control part on the unit or via a remote control device.

Type B: Centrally Chilled and Heated Water Fan-Coil HVAC Unit

This type of HVAC unit is typically located in the dropped ceiling of entry foyer of the room. It consists a coil (radiator) assembly and fan (blower). Chilled or heater water is pumped through the coil from a central source. The fan operation and/or water valves are controlled by the wall-mounted thermostat in each room. The operation power of thermostat can be AC mains or a low voltage (24V) type power from a fan-coil mounted transformer.

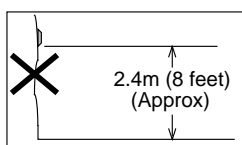
The HEM-550 system can be used to control any electrically or pneumatically operated HVAC units.

Note: Certain models of HVAC units contain a built-in energy management interface. The HEM-550 system is designed to directly connect to these units without the use of Power Pack, if 24 VAC power supply is available. Please refer to the instructions of HVAC units to make the wiring connection correctly. No voltage, "dry" contact output format is generally required to turn "OFF" the unit.

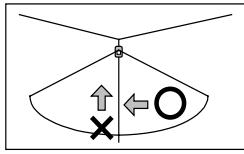
The HEM-550 system installation consists of mounting and wiring of each component. The following diagrams and instructions provide some useful references for ease of installation.

4.2 Select Mounting Location of HEM-550

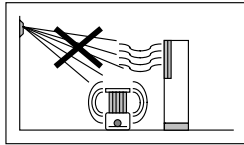
Selection a proper mounting location of the HEM-550 Master Sensor/Controller is very important in assuring optimum performance of the system. Improper location of HEM-550 may result in poorer performance. Following hints should be fully noticed before installation.



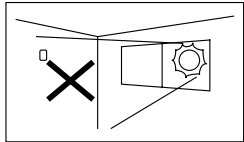
- The sensor should be mounted at 8 ft. above the floor, preferably in a corner that has a good field of view to the movements of hotel guest.



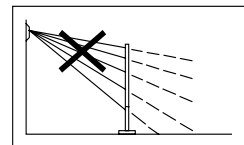
- The sensor is more sensitive to the movements across the detection zones than those toward or away the sensor.



- AVOID facing the sensor toward any object likely to change temperature rapidly, such as electric heater or fireplace.



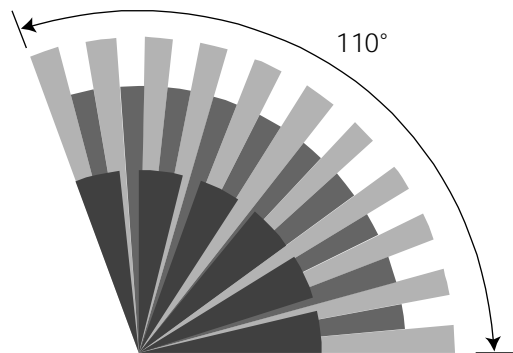
- AVOID mounting the sensor where it will receive direct sunlight or direct draft of heating/cooling vents.



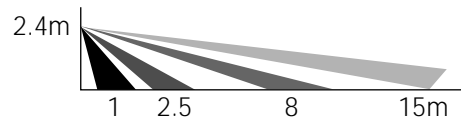
- AVOID locating the sensor where its detection zones may be blocked by doors, draperies or curtains.

DETECTION PATTERN

Top view

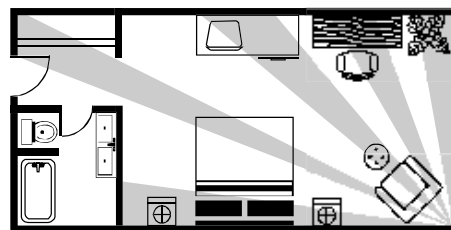
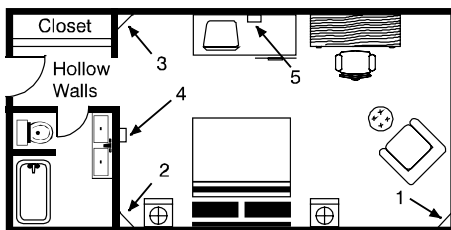


Side view



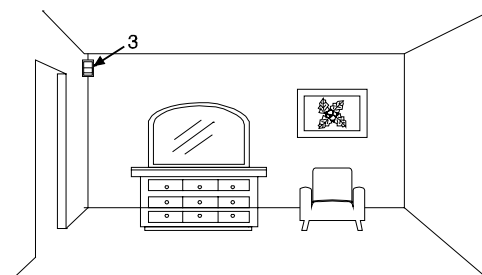
Recommended sensor locations

The numbers indicated represent order of preference.



Recommended Mounting Locations in order of Preference

CAUTION
Make sure that hot or cold air from HVAC vents does not blow directly on Sensor, especially in location 1.



4.3 Wiring Techniques

- Conceal the sensor wiring by “fishing” the wire from hollow wall or partition.
- Drill an adequate hole behind the sensor, so that the sensor can cover the hole.
- Drop a string with a small weight inside the wall to bottom.
- Drill another hole on wall at the carpet level. Use a stiff wire with a hook to pull the string out from the hole.
- Pull the cable to the door switch, HVAC unit and slave sensor, if necessary.
- Use proper tool to tuck the wire under the edge of carpet.
- Alternatively, staple the wire in the corner and cover it with vinyl corner molding to match room decor.
- Wiring should be completed and concealed in a manner that it will not be damaged by hotel guest or housekeeper.

4.4 Mount the Sensor (OS-550/OS-550T/HEM-550)

1. Remove the sensor cover by releasing the locking screw at the bottom of the housing.
2. Carefully remove the circuit board by releasing the fixing screw.
3. For corner mount (recommended), use the mounting holes on both 45° slopes to mount the base.
4. Lead the cable into the base. Replace the circuit board on the base and fixed with screw.

4.5 Install the Door Switch

1. Carefully select the location on the doorframe to mount the door switch.
2. Use a proper tool to drill a 3/4" hole in the frame.
3. Using the spacer or switch as a guide, drill two proper holes for POP rivets or fixing screws.
4. Drill a small hole just above the carpet for wire entry into the door frame.
5. Lead the wires (2) out from the big hole for switch and connect with the switch.
6. Insert the switch into the hole and mount it firmly with the doorframe. If the gap between door and frame is too big, use a spacer to ensure proper operation of the switch.

4.6 Wiring Connection

To connect the wires between HEM-550 and other components of the system, the terminals of HEM-550 should be connected with correct wire to ensure optimum performance. Each terminal block of HEM-550 are described as follow in the left to right sequence.

- **SLA:** This terminal and terminal “**GND**” are for connection with the N.O. output of slave sensor. If multiple slave sensors are used, the connection should be made in parallel.
- **GND:** This terminal normally goes together with terminal “**SLA**” or “**DSW**” for connection with slave sensor or door switch.
- **DSW:** This terminal and terminal “**GND**” are for connection with the door switch. If multiple door/window switches are used, the connection should be made in series.
- – **OCC +:** These two terminals provide occupancy status output for guest-in-room detection.
- – **24V +:** These two terminals are for the input of 24V power supply from power pack.
- **NC:** This terminal and terminal “**COM**” form the Normally Closed (NC) output of HEM-550.
- **COM:** This terminal is the common pole of relay output.
- **NO:** “**NO**” and terminal “**COM**” form Normally Open (NO) output of HEM-550.

4.7 System Operation Test

1. After wiring connection is completed, ensure the jumper JP7 is placed at “**TEST**” mode. Replace and fasten the front cover with the locking screw.
2. Whenever power is applied on the HEM-550, please wait for about 25 seconds for sensor to warm-up. During warm-up period, the buzzer will sound beep-beep (each beep lasts 1 second). Both LED and relay will be activated.
 - ① The activated HEM-550 means the HVAC unit will NOT operate due to its fail-safe design.
3. When warm-up period expires, the buzzer stops sounding, LED lights off, but relay will still be active.
4. **DOOR SWITCH TEST** - Open the door, the buzzer should sound constantly until the door is closed.
 - ① If the buzzer does not sound while door is opened, check the door switch and ensure correct wiring connection between door switch and HEM-550.
5. **SLAVE SENSOR TEST** - If NO slave sensor is installed, please skip this test. The detection of slave sensor should be tested after the door switch function is tested okay. Walk across in the room of slave sensor installed, the LED of slave sensor will light on whenever it detects the movement. The buzzer of HEM-550 will sound one long beep (1 sec.) and - one short beep (0.2 sec.) when slave sensor is activated.

① If the buzzer does not sound when slave sensor detects the movement but the LED of slave sensor is working, check the wiring between slave sensor and HEM-550.

6. **MASTER SENSOR TEST** – Walk across in the room of master sensor installed. The LED will light on and the buzzer will sound beep-beep (0.2 sec.) whenever master sensor detects the movement. The HVAC unit will operate at least 30 seconds for every detection.

① If no further movement is detected within 30 seconds after the last detection, the HVAC unit will stop operating.

4.8 Normal System Operation

After the system operation test completed, ensure to place the jumper JP7 to “NORMAL” position for normal operation of the system. The normal operation of HEM system is quite sophisticated. Many different operation modes and statuses are carefully managed and controlled by the microprocessor. Various modes and statuses are described as follow;

Standby Mode

If the room is vacant, the system will enter into “standby” mode after the warm-up time expires. Under standby mode, the HVAC unit will not operate.

Temp-control Status

While room is unoccupied, the temperature sensor of HEM-550 will measure the room temperature every 5 minutes. When room temperature goes higher or lower than the high/low setting, the HVAC unit will automatically operate until the room temperature goes back to the set range. Once the room temperature returns to the set range, the system will return to “standby” mode. This function will only operate if jumper heads are set in place and HVAC unit is “ON”.

Occupied Mode

If master or any slave sensor detects the movement during standby mode, the system will enter into “occupied” mode. Under the “occupied” mode, the hotel guests can manage or set the room temperature via the HVAC wall unit according to their preference.

Door-open Status

Whenever the door is opened, the system will detect it and enter into “door-open” status. The HVAC unit will operate and LED will flash for 10 seconds. The LED flash is to indicate that the system function is normal.

If the door is left open for more than 5 minutes, the system will shut off the HVAC unit until the door is closed.

Delay Status

Once the door is closed, the system will enter into "delay" status. During this 10-second period, the system will remain as its original mode.

Waiting Mode

The system will enter into "Waiting" mode after the second delay status expires.

If master or any slave sensor detects the movement during waiting mode, the system will enter into "occupied" mode.

If no movement is detected within 5 minutes, then system will enter into "standby" mode.

4.9 Install the Slave Sensor

For the additional rooms of hotel suites or condominiums, the system may require slave sensors (OS-550 or OS-550T) to be connected with HEM-550. Installing the slave sensor is basically same as HEM-550. Select the location where the slave sensor can have a good view of the additional room. Try to locate the slave sensor so that you can run a 4-core cable to the master sensor shorter and easier, if possible.

Connect the wires according to the instructions in 4.6.

4.10 Install the Additional Door/Window Switches

For multiple entry/exit doors to the room, additional door switches (DS-100) may be required to connect to the DSW terminals of HEM-550 in series.

A pair of surface mount magnetic switch can be installed on the sliding door/window to inhibit the operation if the door/window is left open for a period of time. The switch signals should be connected with the same terminal blocks as DS-100 door switch in series.

5. Specifications

5.1 HEM-550 Master Sensor/Controller

Power supply	24 ± 2 VAC/DC
Current drain	Standby: 20 mA, Operating: 10 mA
Relay output	Form C (NC-COM-NO), power or dry contact selectable
Max. switching current	NO: 5A, NC: 3A, resistive load
Max. switching voltage	AC: 250V, DC: 30 V
High temperature limit	26/28/30°C (79/82/85°F) programmable
Low temperature limit	11/13/15°C (51/55/59°F) programmable
Detection coverage	110° wide, 15m (50ft) long @25°C(77°F)
Warm-up period	25 ± 2 seconds
Restart cycle protection	2 minute, can be disabled
Test indication	Buzzer (audible) and LED (visible) , can be disabled
Housing material	ABS
Operating temperature	-10°C ~ 60°C (14°F ~ 140°F)
Operating humidity	Max. 95% RH non-condensated
Dimensions	112 x 66 x 45 mm (4.4 x 2.6 x 1.8 inch)

5.2 PP-116/PP-216 Power Pack

Power supply	PP-116: 95 ~ 120 VAC, PP-216: 220 ~ 240 VAC
Power output	24 VDC, 100 mA max.
Relay output	Form C (NC-COM-NO)
Max. switching current	NO: 16A, NC: 10A, resistive load
Max. switching voltage	AC: 250V
Housing material	ABS
Operating temperature	-10°C ~ 60°C (14°F ~ 140°F)
Operating humidity	Max. 95% RH non-condensated
Dimensions	110 x 52.5 x 30 mm (4.3 x 2.1 x 1.2 inch)

5.3 OS-550 Slave Sensor

Power supply	24 ± 2 VAC/DC
Current drain	Standby: 5 mA, Operating: 18 mA
Relay output	Form C (NC-COM-NO) dry contact only, 0.2A max.
Detection coverage	110° wide, 15m (50ft) long @25°C(77°F)
Warm-up period	25 ± 2 seconds
Operating temperature	-10°C ~ 60°C (14°F ~ 140°F)
Operating humidity	Max. 95% RH non-condensated
Dimensions	112 x 66 x 45 mm (4.4 x 2.6 x 1.8 inch)

5.4 OS-550T Slave Sensor

Power supply	24 ± 2 VAC/DC
Current drain	Standby: 7 mA, Operating: 23 mA

Relay output	Changeover (NC-COM-NO)
Max. switching current	NO: 5A, NC: 3A, resistive load
Max. switching voltage	AC: 250V, DC: 30 V
High temperature limit	26/28/30°C (79/82/85°F) programmable
Low temperature limit	11/13/15°C (51/55/59°F) programmable
Detection coverage	110° wide, 15m (50ft) long @25°C(77°F)
Warm-up period	85 ± 5 seconds
Housing material	ABS
Operating temperature	-10°C ~ 60°C (14°F ~ 140°F)
Operating humidity	Max. 95% RH non-condensated
Dimensions	112 x 66 x 45 mm (4.4 x 2.6 x 1.8 inch)

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