

QPA63 Series

CO₂/VOC Sensors



QPA63.1

QPA63.2

Description

Sensors designed for sensing indoor air quality in rooms or air ducts; microprocessor-based units consisting of a selective photo-acoustic CO₂ sensor and a VOC¹ sensor with a heated stannic dioxide semiconductor.

Operating voltage: 24 Vac

Output signals: 0 to 10 Vdc

The QPA63 VOC Sensor can detect any of the following gases:

Alcohol	Ethylene Oxide	n-Hexane 2
Acetone	Formaldehyde	n-Patene
Acrylonitriles	Hydrogen	Propane
Ammonia	Hydrogen Sulfide	R-11
Benzene	Isobutane	R12
Carbon Dioxide	Methane	R123
Carbon Monoxide	Methanol	R502
Chlorides	Methyl Acetate	Sulfur Dioxide
Dimethyl Amines	Methyl Chloride	Vinyl Chloride
Ethane	Methyl Ether	
Ethylene	Methyl Ketone	

1. VOC = Volatile Organic Compounds (also called mixed gas)

Application

The QPA63 Series sensors are used in HVAC applications to enhance room comfort and to optimize energy consumption by providing demand-controlled ventilation.

The sensor monitors the following:

- CO₂ concentration as an indicator for occupancy in rooms where smoking is prohibited.
- VOC concentration as an indicator for combustible gases and room odors (tobacco smoke, body odor, material fumes) in the air.

Application, Continued

The sensor can be used as the following:

- Room sensor to measure room air quality.
- Duct sensor in conjunction with the ARG64 duct mounting kit to measure exhaust air quality.

Typical areas of use:

- Measuring CO₂ and VOC concentration.
In party rooms, lounges, exhibition halls, restaurants, canteens, shopping malls, gymnasiums, sales rooms, and conference rooms. In this case, the AQP63.1 ventilation demand processor, which calculates the ventilation demand signal for the ventilation controller based on the CO₂ and VOC signal, is required. For more information on the AQP63.1, see *Technical Instructions* (CM1N1959E-P25).
- Measuring CO₂ concentration.
In rooms with varying occupancy at different hours where smoking is prohibited such as museums, theaters and auditoriums.

NOTES: 1. The sensors cannot be used as safety devices, such as gas or smoke warning devices.

2. The sensors cannot be used on rooftop air ducts (solar radiation).

Product Numbers

Table 1.

Product Number	Description
QPA63.1	CO ₂ /VOC Sensor Without LEDs
QPA63.2	CO ₂ /VOC Sensor With LEDs
ARG64	Duct Mounting Kit for QPA63 Series
ARG70	Wall Mounting Kit for QPA63 Series

Ordering

You must order the ARG64 Duct Mounting Kit separately.

Compatibility

The sensors are suited for use with all systems, controllers and devices capable of acquiring and handling the 0 to 10 Vdc output signal.

Function

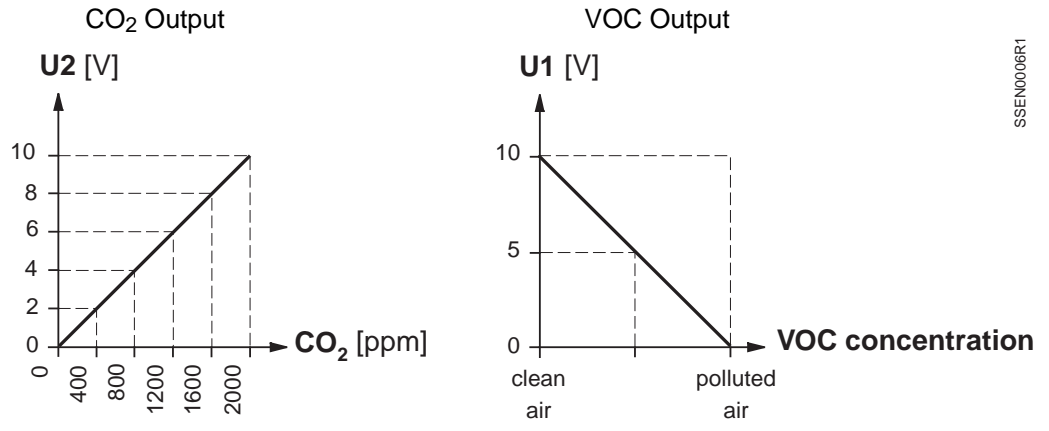
The sensor detects the CO₂ and VOC concentrations in the room or in the exhaust air duct.

The CO₂ concentration is evaluated by the sensor. The output signal delivered (connection terminal U2) is proportional to the CO₂ content of the ambient air.

The number of LEDs lit is proportional to the CO₂ concentration. The poorer the air quality, the more LEDs are lit.

The acquired VOC concentration is also passed on to a sensor output (connection terminal U1). The output signal provided is inversely proportional to the concentration of oxidizable gases (VOCs), such as tobacco smoke, CO, alcohol and body odors. This means that when the VOC concentration increases, the signal voltage will drop towards 0V, and when the VOC concentration decreases, the signal voltage will rise towards 10V. The AQP63.1 is required to evaluate the output signal.

Function, Continued



Legend:

- U1 Signal voltage at output U1 (VOC) in volts
- U2 Signal voltage at output U2 (CO₂) in volts
- 1 ppm = 1 part per million

Figure 1. Function Diagram.

Mechanical Design

Sensor QPA63...

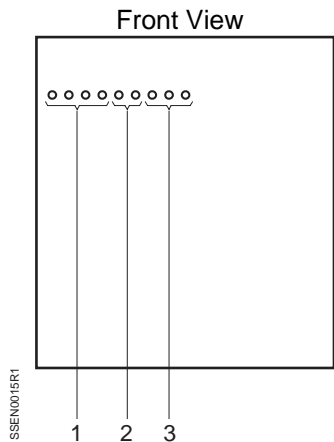
The sensors have been designed for wall mounting. They are suitable for use with most commercially available recessed conduit boxes. The cables can be introduced from the rear (concealed wiring) or from below or above (surface-mounted wires) through knockout openings.

All terminals are protected against incorrect wiring.

The units consist of two major parts: four-sectional housing and base. Both snap together, but can be detached again.

The housing accommodates two sensing elements, the electronics and depending on the type of sensor, various setting elements and LEDs.

Connection terminals are in the base.



Legend:

- 1 Green LEDs = 0 to 1000 ppm CO₂
- 2 Yellow LEDs = 1000 to 1400 ppm CO₂
- 3 Orange LEDs = 1400 to 2000 ppm CO₂

Figure 2. Indicator Lights (Only with QPA63.2).

**Duct Mounting Kit
 ARG64**

The duct mounting kit has been designed to mount the sensor in an exhaust air duct. The kit consists of a two-section plastic housing and an attached metal rod with a clamped-on, adjustable duct-mounting flange. There is an air inlet (three holes) and an air outlet at the bottom of the rod. The sensor mounting plate is installed in the lower part of the housing; the plate corresponds to the mounting plate of the QPA63... The upper part of the housing consists of a high, grey, removable cover, rubber seal and four mounting screws. The housing is supplied complete with a ready wired five-wire connecting cable.

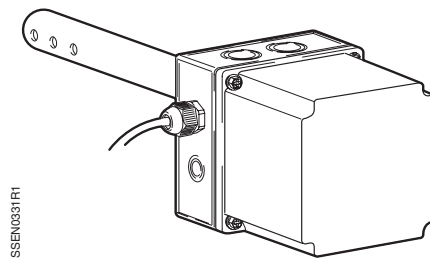


Figure 3. ARG64.

Engineering Notes

- The CO₂/VOC sensors cannot be used for safety-related measurements of gas concentrations.
- The CO₂/VOC sensors cannot be used for rooftop air ducts (solar radiation).

Duct mounting with an ARG64:

1. Install the rod in the direction of flow. Do not twist more than 10°.
2. Maximum permissible air velocity in the duct = 16 feet/second (5 m/second).
3. Maximum permissible temperature inside and outside the duct:= 95°F (35°C)
4. Minimum duct immersion depth = 6-11/16 inches.

Mounting

Sensor QPA63...

Room mounting

When mounting in a room, a location with typical air quality should be chosen such as on an open wall, approximately five to ten feet (1.5 to 3 m) above the floor. The sensor should not be mounted in niches, shelves, behind curtains, and so on, or in locations where people are constantly present.

Observe permissible ambient conditions.

Mounting instructions are included.

Duct mounting with an ARG64 duct mounting kit

Install the rod in the exhaust air duct as close as possible to the air outlet, in the direction of flow.

Mounting instructions are included in the mounting kit.

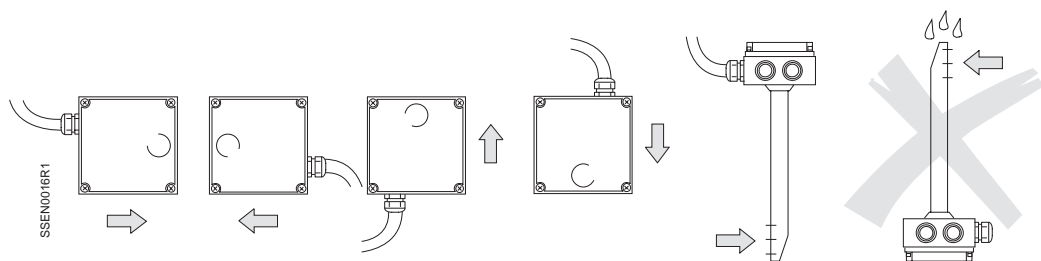


Figure 4. Permissible and Non-permissible Mounting Positions.

Commissioning Notes

Check the CO₂/VOC sensor functions 30 minutes after applying operating voltage as follows:

- Check the CO₂ function: exhale on the sensor.
- Check the VOC function: touch the sensor with a cotton ball doused in alcohol (possibly gas from lighter, without flame).

Ventilation should start as soon as the preset switching level of the connected controller is reached.

After supplying power to the QPA63.2, the LEDs will flash for about one minute.

Specifications

Power Supply	Operating voltage (Class 2)	24 Vac \pm 20%
	Frequency	50/60 Hz
	Power consumption	Maximum 6 VA
Range of use	CO ₂ measuring range	0 to 2000 parts per million
	CO ₂ tolerance	\pm 100 ppm
	VOC measuring range	0 to 10 V _{VOC}
	Permissible air velocity in the duct	<16 feet per second (<5 m per second)
Electrical	Voltage	0 to 10 Vdc
	Current	\pm 1 mA
	Permissible wire lengths:	
	Copper cable 20 AWG	197 feet (60 m)
	Copper cable 18 AWG	722 feet (220 m)
Copper cable 16 AWG	984 feet (300 m)	
Copper cable 14 AWG	1,475 feet (450 m)	
Connection Terminals	Screw terminals for	2 x 16 AWG or 1 x 14 AWG
Environmental Conditions	Operation	
	Temperature	
	Wall mounting	23°F to 113°F (–5°C to 45°C)
	Duct mounting	14°F to 95°F (–10°C to 35°C)
	Humidity (non-condensing)	5% to 95% rh
Transport		
Temperature	–13°F to 158°F (–25°C to 70°C)	
Humidity	<95% rh	
Weight	QPA63...	Approximately 0.22 lb (3.5 oz) [0.1 kg]
	ARG64	1.5 lbs (24 oz) [0.69 kg]

Installation

Drywall Mounting

1. Place a small screwdriver into bottom of sensor and press in the two locking tabs located in the second air vent to remove cover.
2. Remove sub-base from back of sensor.
3. Using the sub-base (packed with sensor) as a template, mark the hole locations with a pencil.
4. Drill two 1/4-inch diameter holes for plastic wall anchors.
5. Using a mallet, tap in the plastic wall anchors flush with wall.
6. Pull the wiring through the opening in the upper portion of the sub-base.
7. Level mounting plate. Using two wood screws, fasten sub-base to wall. The sensor is not position sensitive.
8. Pull the wiring through the sub-base.
9. Position sensor housing over the two mounting lugs located at the top of the sub-base and press down on cover until bottom lugs snap in place.
10. Terminate wires per wiring instructions on the inside of sensor cover.
11. Insert the top of the sensor cover into the slots located on the top of the sensor and press down until the two locking tabs snap into the second ventilation slot.

The installation is now complete.

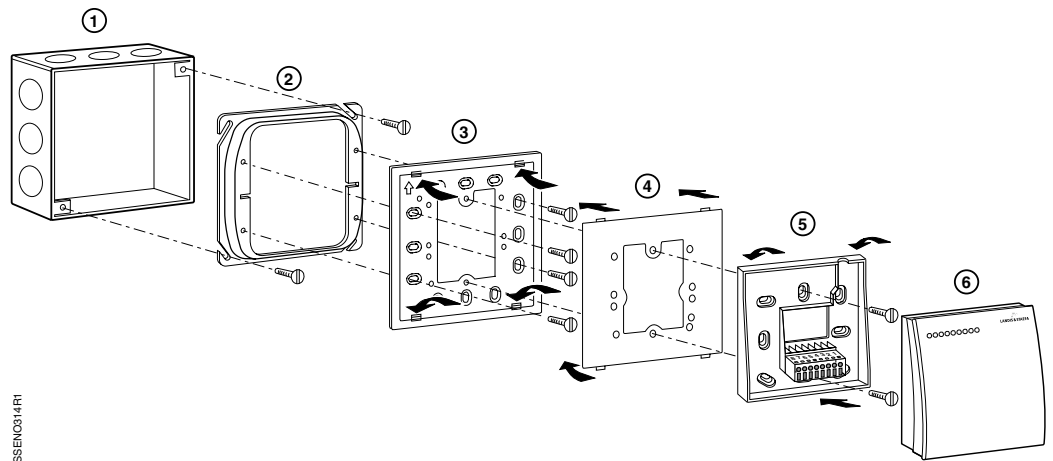
4 x 4-inch Electrical Wall Box Mounting

See Figure 5

An ARG70 wall plate adapter is required to mount a QPA63 Series sensor to a 4 x 4-inch electrical wall box. The ARG70 must be ordered separately.

1. Place small screwdriver into bottom of sensor and press in two tabs located in the second air vent to remove cover.
2. Using the four screws provided, fasten wall box adapter (3) to plaster ring (2), supplied by others.
3. Flex adapter mask (4) and snap in place inside wall box adapter (3).
4. Fasten sub-base (5), included with the QPA63, to wall box adapter assembly (3) and (4) with the two screws provided.
5. Pull wires through plaster ring (2).
6. Follow *Drywall Mounting* Steps 6 through 11.

The installation is now complete.

**Installation,
Continued****Figure 5. 4 x 4-inch Electrical Wall Box Installation.**

- | | | | |
|---|---------------------|---|----------------|
| 1 | Electrical wall box | 4 | Adapter mask * |
| 2 | Plaster ring | 5 | Sub-base |
| 3 | Wall box adapter * | 6 | Sensor cover |

* Included with ARG70

**2 x 4-inch Electrical Wall
Box Mounting**

See Figure 6

An ARG70 wall plate adapter is required to mount QPA63 Series sensor to a 2 x 4-inch electrical wall box. The ARG70 must be ordered separately.

1. Place small screwdriver into bottom of sensor and press in two tabs located in the second air vent to remove cover.
2. Using the two screws provided, fasten wall box adapter (3) to plaster ring (2), supplied by others.
3. Flex adapter mask (4) and snap in place inside wall box adapter (3).
4. Fasten sub-base (5), included with the QPA63, to wall box adapter assembly (3) and (4) with the two screws provided.
5. Pull wires through plaster ring (2).
6. Follow *Drywall Mounting* Steps 6 through 11.

The installation is now complete.

**Installation,
 Continued**

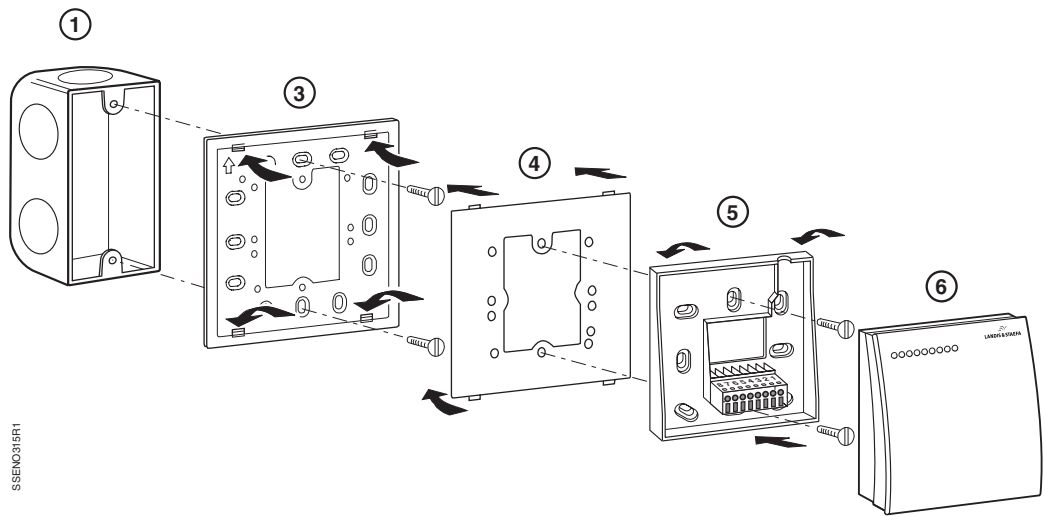


Figure 6. 2 x 4-inch Electrical Wall Box Installation.

- | | | | |
|---|---------------------|---|--------------|
| 1 | Electrical wall box | 5 | Sub-base |
| 3 | Wall box adapter * | 6 | Sensor cover |
| 4 | Adapter mask * | | |
- * Included with ARG70

Wiring Diagrams

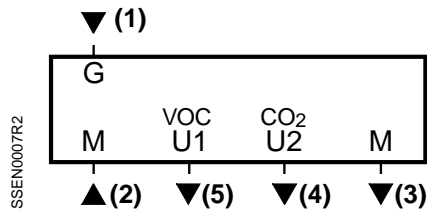


Figure 7. Wiring Terminals.

- | | |
|------|--|
| G, M | Operating voltage 24 Vac (Class 2) |
| G | System potential |
| M | System neutral |
| U1 | Signal output "Measured value VOC", 0 to 10 Vdc |
| U2 | Signal output "Measured value CO ₂ ", 0 to 10 Vdc |
| M | Measuring neutral (terminals M are interconnected inside the sensor) |

**Wiring Diagrams,
 Continued**

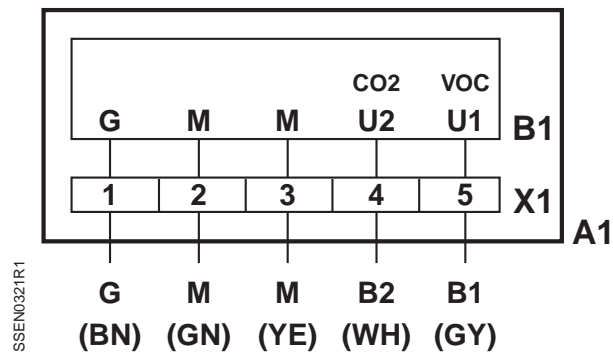


Figure 8. ARG64 with QPA63... Wiring Diagram.

- A1 Duct mounting kit ARG64
- B1 CO₂/VOC sensor QPA63...
- X1 Terminal strip in the duct mounting kit ARG64

Wire code on connection cable of the ARG64:

- | | | |
|----------|-----|--|
| G/brown | (1) | System potential 24 Vac (Class 2) |
| M/green | (2) | System neutral 24 Vac (Class 2) |
| M/yellow | (3) | Measuring neutral (System neutral) |
| B1/grey | (5) | Signal output "Measured value VOC", 0 to 10 Vdc |
| B2/white | (4) | Signal output "Measured value CO ₂ ", 0 to 10 Vdc |

NOTE: For individual panel wiring details, see the appropriate hardware manual.

Dimensions

All dimensions in inches
 (millimeters)

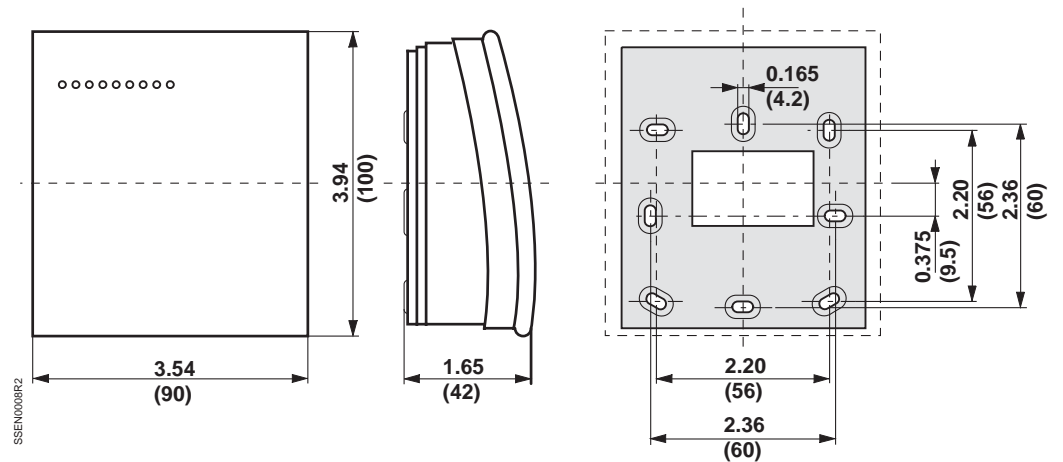


Figure 9. QPA63 Series Dimensions.

Dimensions, Continued

All dimensions in inches
 (millimeters)

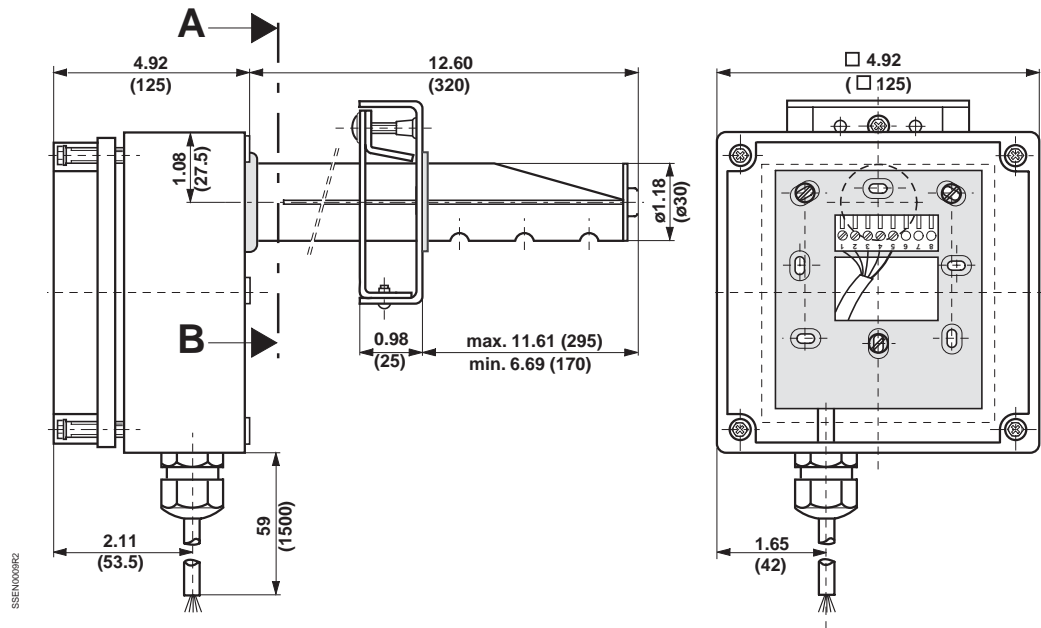


Figure 10. ARG64 Dimensions.

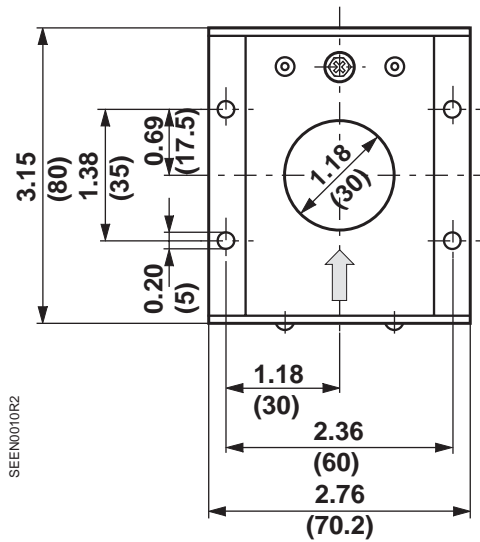


Figure 11. Cross-section A – B Dimensions.

**Dimensions,
 Continued**

All dimensions in inches
 (millimeters)

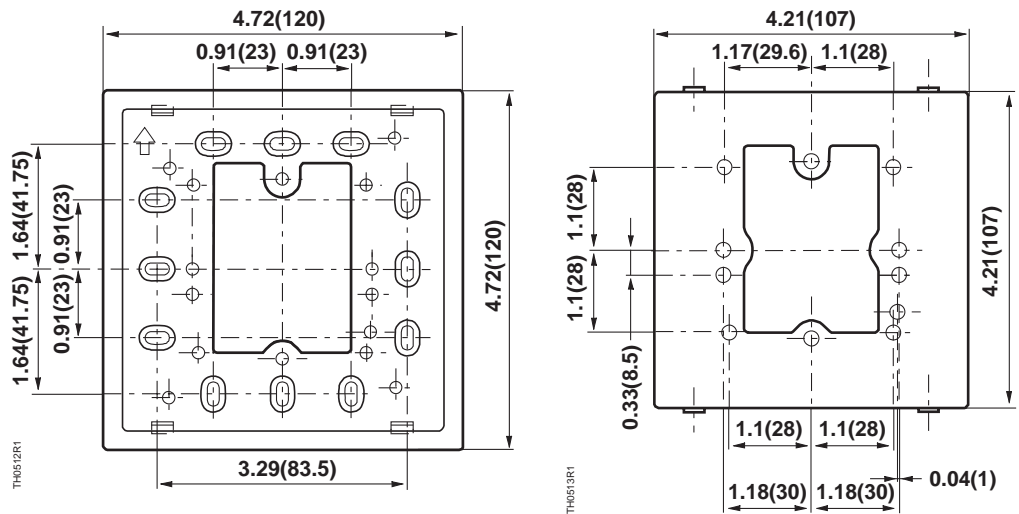


Figure 12. ARG70 Dimensions.

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