SIEMENS

QSA2700D   QSA2700

QSA2700D / QSA2700 / AQS2700

Fine dust room sensor

Basic Documentation

Table of Contents

1 About this document

1.1 Revision history

Edition	Date	Changes	Section
b	2018-01	Frequency	Technical data
a	2017-12	First version.	All

1.2 Reference documents

Ref.	Document title	Document number
1	Mounting instructions	A6V11160930
2	Datasheet	A6V11160938

You can download the above documents at http://siemens.com/bt/download;
Simply search by document numbers.

1.3 Before you start

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Markups

Special markups are indicated in the document as follows:

•	Numbered lists and instructions with an operation sequence
1. 2.	Procedures must be performed in the specified order.
[➔ X]	Reference to a page number

Symbol identifications

⚠	⚠ WARNING
	This is the symbol for hazard. It warns you of **Risks of injury.** Comply with all measures designated by this symbol to prevent injury or death.

!	NOTICE
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2 Product overview

The fine dust room sensor is designed to measure and transmit indoor concentrations of PM2.5 and PM10. This wall-mounted product has variants with or without displays and can connect directly to Siemens BT controllers as well as many third party controllers via voltage output or Modbus.

2.1 Type summary

| Type	Order number	Description	Display
QSA2700	S55720-S457	Room sensor for detection of PM2.5 and PM10	3-color LED service indication
QSA2700D	S55720-S458	Room sensor with LCD display for detection of PM2.5 and PM10	2.4-inch color LCD screen for PM2.5 values, Air Quality Index, and service
AQS2700	S55720-S459	Sensor module for replacement	

2.2 Contents of QSA2700D and QSA2700

Items	Quantity
Fine dust sensor	1
Plastic mounting plate	1
Screws	2 pcs
Mounting instructions	1

2.3 Features

The fine dust room sensor is designed to measure and transmit indoor concentrations of PM2.5 and PM10.

- 0…10 V and Modbus output
- Configurable Modbus parameters
- Plug&play configuration for Siemens Climatix™ controller
- QSA2700:
  - 3-color LED service indication
- QSA2700D:
  - 2.4-inch color LCD screen for PM2.5 values and AQI indication
  - Energy efficient mode: The screen is off if no one is in front of the sensor (within 1 m for several minutes)
  - Micro USB DC 5V for display
  - 4 selectable languages: English, Chinese (default), German, French
  - 3 selectable Air Quality Index classes

2.4 Device overview
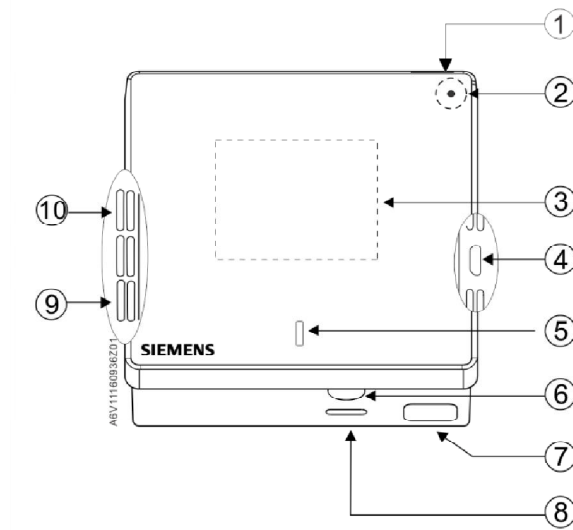
1	Hole for wiring (top) for surface mounting
2 [**QSA2700 only**]	LED
3 [**QSA2700D only**]	LCD display
4	(power supply for display only)
5 [**QSA2700D only**]	Proximity sensor
6	Push button
7	Hole for wiring (bottom) for surface mounting
8	Hole for attaching the mounting plate to the housing
9	Air outlet
10	Air inlet

2.5   Normal display overview of QSA2700D
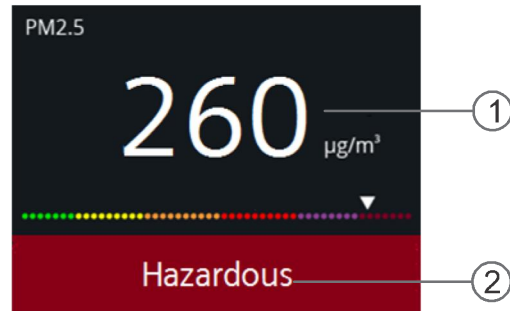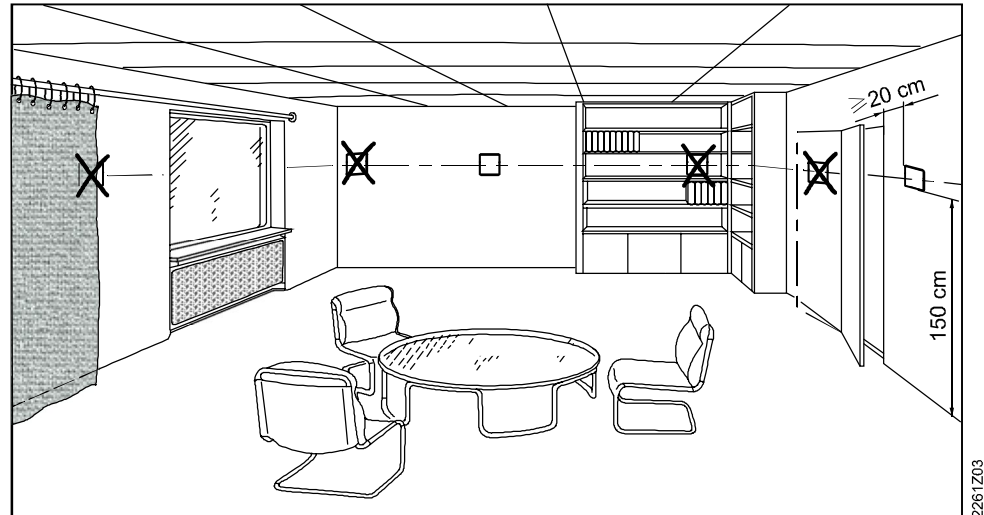

	1	Current Air Quality Index (refer to Air Quality Index classes [➜ 22] for more information)
	2	The current Air Quality Index category

3 Installation

3.1 Mounting requirements

Mounting position

- The sensor is suitable for conduit box mounting, dry wall mounting (with mounting hole for wires concealed) and surface mounting.
- The recommended height is 1.2-1.5 m above the floor, especially for type with display.
- Do not mount the sensor in recesses, shelves, behind curtains or doors, or above heat sources.
- Avoid direct solar radiation.
- Seal the conduit box or the installation tube if any, as air currents can affect sensor readings.
- Make sure ambient conditions are within 0…50 °C and 5...95% r.h. (no condensation).
- Do not mount device in places full of oil smog, e.g. in a kitchen.
- Peel off the protective film on air inlet and air outlet before using.
- The air inlet and outlet must be free of any blockage, particularly the floc type of dirt.

!	*NOTICE*
	High concentrations of cigarette/oil smog in, for example, smoking rooms, may affect the optical components inside the sensors. We highly recommend replacing the sensor module at the latest annually in such environments.

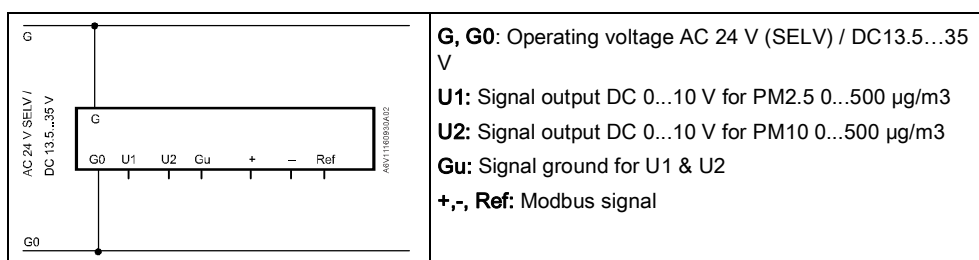| !	*NOTICE*
	Ultrasonic humidifiers can create fine dust from unpurified water that can distort sensor readings. Do not use in spaces with PM2.5 controlled ventilation.

Mounting dimensions
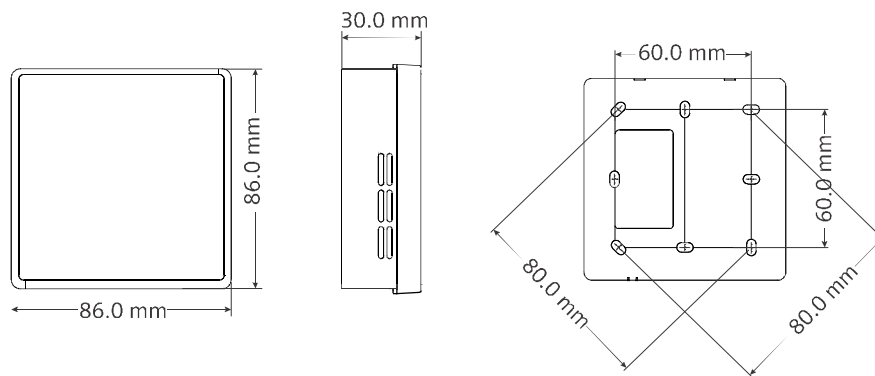
Mounting tools

- Wire stripper
- Screw driver
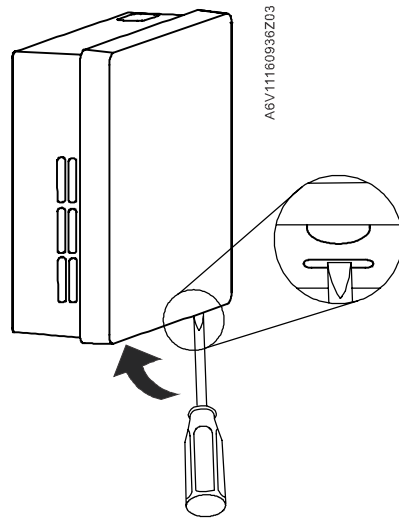- Pencil, level & drill (for dry wall mounting and surface mounting only)

Wire specification

Wires for	Specifications
Power supply	0.4 to 1.5 mm^2
Analog output	0.4 to 1.5 mm^2
Modbus output	Twisted pair 0.4 to 1.5 mm^2 Length <600m

3.2 Wiring

G, G0: Operating voltage AC 24 V (SELV) / DC13.5…35 V

U1: Signal output DC 0...10 V for PM2.5 0...500 µg/m3

U2: Signal output DC 0...10 V for PM10 0...500 µg/m3

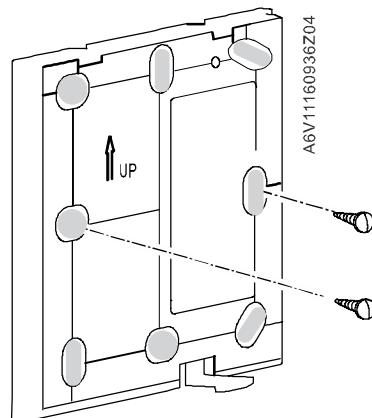**Gu**: Signal ground for U1 & U2

**+,-, Ref**: Modbus signal

3.3 Installation

1. Separate the housing from the mounting plate using a screw driver.

2. Screw and fix the mounting plate on a conduit box (**Conduit box mounting**), or on a wall (**Dry wall mounting** if there is a mounting hole and the wires are concealed in the hole; **Surface mounting** if there is no mounting hole).

3. Connect and screw wires correctly to the terminal. For surface mounting, you must break out the wiring hole at the top or bottom first.
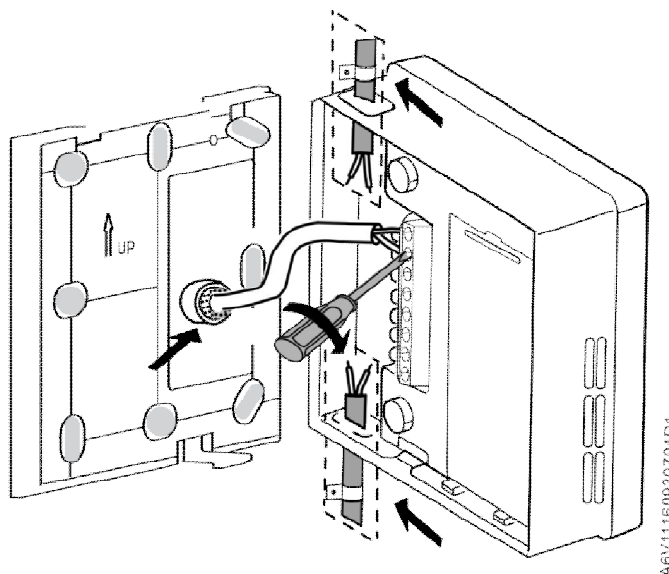
4. Attach the housing to the mounting plate at the top and then snap on the housing at the bottom.
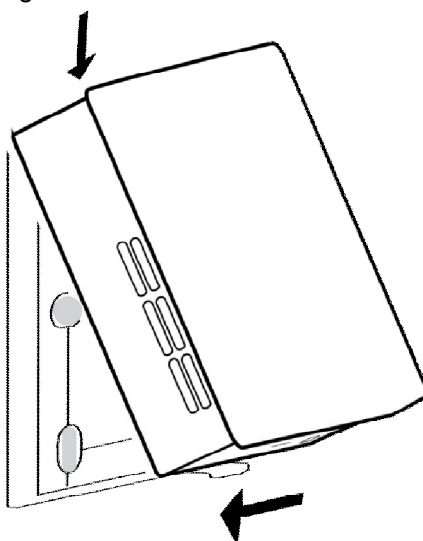
4 Configurations

4.1 Modbus configuration parameters

The sensor is a Modbus (RS485) slave device, configurable via a Modbus master.

	Name	Range / Enumeration	Default
Configurable	Address	1...247	1
	Baud rate (bps)	1 = 9600 / 2 = 19200/ 3 = 38400 / 4 = 57600	19200
	Transmission format	0 = 1-8-E-1 / 1 = 1-8-O-1 / 2 = 1-8-N-1 / 3 = 1-8-N-2	0
Basic	Parity	Even / Odd / No	Even
	Stop bits	1 / 2	1
	Connection	<= 32pcs/line	
	Data	8 bits (0-255)	
	Identity	Slave	
	Cable length	<600m	

4.2 Modbus registers

Holding Register No.	Name	Description	Default	R/W
257	PM2.5 value	Range: 0…500		R
258	PM10 value	Range: 0…500		R
260	Sensor working status	0: Normal; 1: Replace sensor module; 2: Communication error		R
296	Software version	Major version		R
297	Software version	Minor version		R
298	Software version	Build version		R
764	Modbus address	1…247	1	R / W
765	Baud rate	1= 9600bps / 2 = 19200bps / 3 = 38400bps / 4 = 57600bps	2	R / W
766	Transmission format (start bit – data bits – parity – stop bit)	0 = 1-8-E-1 / 1 = 1-8-O-1 / 2 = 1-8-N-1 / 3 = 1-8-N-2	0	R / W
768	Bus configuration command	0 = Ready / 1 = Load / 2 = Discard	0	R / W

Remarks:

- The register number is counted from 1.
- In the event the value for register number 764 (Modbus address), 765 (Baud rate), or 766 (Transmission format) changes, power off the device and turn it on again to activate the changed value.
- Register number 768 (Bus configuration command) is for Climatix™ plug&play configuration.
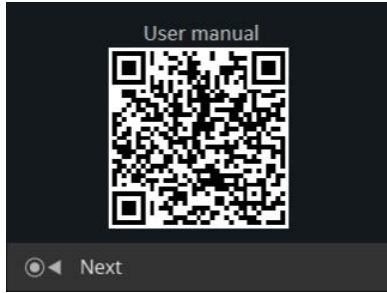
4.3 Push button configuration (QSA2700)

Press the push button to automatically reset and configured via Climatix™ controllers with pre-programmed plug&play configuration.

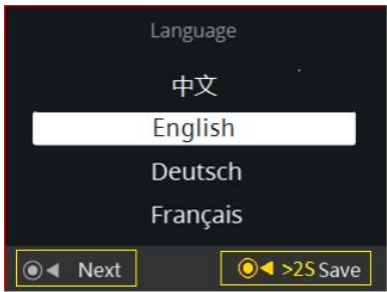| Press the button for	LED	Action	More details
1…5 s	Constant red	Keep pressing	
5…10 s	LED off	Release the button to configure the device via the Climatix™ controller	LED flashes for 30 s after you release the button, waiting for the configuration via Modbus: • If successful, the LED flashes green for 60 s, then turns to constant green • Otherwise, the LED turns back to its original state
10…13 s	Flash yellow	Release the button to reset the device	Release the button while the LED still flashes yellow. The LED keeps flashing yellow for 3 s, then turns red for 1s, before turning to permanent yellow (the reset is complete).
>13 s	Returns to the initial status	Resetting cancelled	

4.4 LED colors and patterns (QSA2700)

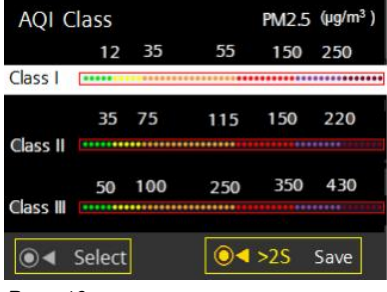| Color	Pattern	Description
Green	Permanently on	Working properly, Modbus configured
Yellow	Permanently on	Working properly, Modbus with factory settings
Red	Permanently on	Error 1, replace sensor module
Red	Flashing (0.5 s on / 0. 5 s off)	Error 2, communication error
Red / yellow	Flashing (0.5 s red / 0. 5 s yellow)	Possible inaccurate measurement

4.5 Initial setup (QSA2700D)

Step	Description	Picture
1.	Power on the device: *Page 1* is displayed. *Short press* the push button to select the language. *Long press* the push button (>2 s) to save the selection.	 *Page 1*
2.	*Short press* the push button to enter *page 2*. *Short press* the push button to select among the different classes. *Long press* the push button (>2 s) to save the selection. **Tip:** refer to Air Quality Index classes [➜ 22] for more info about AQI.	 *Page 2*
3.	*Short press* the push button to enter *page 3*.	 *Page 3*
4.	*Short press* the push button to enter *page 4*. Scan the QR code for the link to download the document.	 *Page 4*

Note: If the device powers off during the initial setup (steps 1-3), restart at step 1.
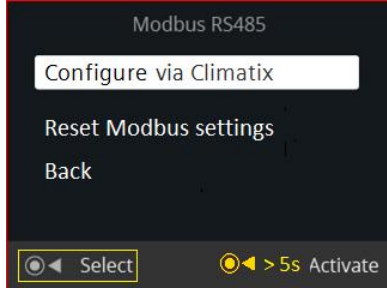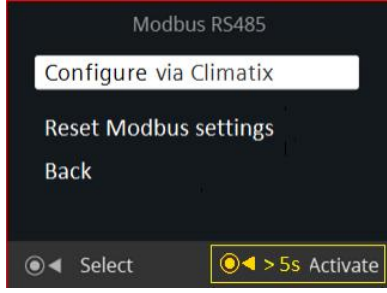
4.6 Change language (QSA2700D)
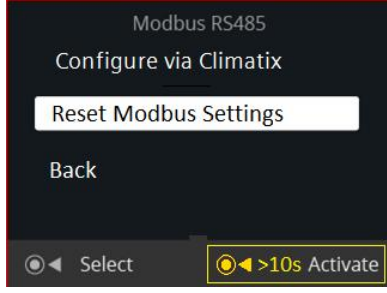
Step	Description	Picture
1	*Short press* the push button to reach *page 7*. Then, *long press* the push button (>2 s) to enter *page 8*.	Language English ◉◀ Next ◉◀ >2S Modify *Page 7*
2	*Short press* the push button to select a language. Then, *long press* the push button (>2 s) to save the selection.	Language 中文 English Deutsch Français ◉◀ Next ◉◀ >2S Save *Page 8*

4.7 Change Air Quality Index class (QSA2700D)

Step	Description	Picture
1	*Short press* the push button to reach *page 9*. Then, *long press* the push button (>2 s) to enter *page 10*.	AQI Class PM2.5 (µg/m³) Class II 35 75 115 150 220 ◉◀ Next ◉◀ >2S Modify *Page 9*
2	*Short press* the push button to select an Air Quality Index class. Then, *long press* the push button (>2 s) to save.	AQI Class PM2.5 (µg/m³) 12 35 55 150 250 Class I 35 75 115 150 220 Class II 50 100 250 350 430 Class III ◉◀ Select ◉◀ >2S Save *Page 10*

4.8 Modbus configuration (QSA2700D)

Press the push button to automatically reset and configured via Climatix™ controllers with pre-programmed plug&play configuration.

Step	Description	Picture
1	From *page 3*, *long press* the push button (2…10 s) to enter *page 5*	PM2.5 **260** μg/m³ ▼ Hazardous *Page 3*
3	*Long press* the push button (>2 s) to enter *page 6*: Note: A *short press* returns to *page 3*.	Modbus RS485 Baudrate 19200 bps Parity Even Stop bits 1 Address 1 ⊙◄ Next ⊙◄ >2S Modify *Page 5*
4	*Short press* the push button to select "Configure via Climatix" or "Reset Modbus settings" on *page 6*. Note: Ensure that the device is properly connected to a Climatix™ controller that is pre-programmed with the plug&play feature.	Modbus RS485 Configure via Climatix Reset Modbus settings Back ⊙◄ Select ⊙◄ > 5s Activate *Page 6*
4.1	When "Configure via Climatix" is selected; *long press* the push button (5…10 s) to activate the function.	Modbus RS485 Configure via Climatix Reset Modbus settings Back ⊙◄ Select ⊙◄ > 5s Activate *Page 6*
4.2	When "Reset Modbus Settings" is selected; *long press* the push button (> 10 s) to activate the function.	Modbus RS485 Configure via Climatix Reset Modbus Settings Back ⊙◄ Select ⊙◄ >10s Activate *Page 6*

5 Technical data

5.1 Power supply

Operating voltage	AC 24 V ±20% / DC 13.5…35 V
Frequency	50/60 Hz @ AC 24 V

5.2 Functional data for PM2.5

Measuring range	0…500 µg/m³
Unit to unit variability	Max of ±15 µg/m³ and ±15% of reading @ 25 °C and 50% r.h.
Analog output signal, (terminal U1)	DC 0...10 V, linear, corresponding to 0...500 µg/m³

5.3 Functional data for PM10

Measuring range	0…500 µg/m³
Unit to unit variability	Max of ±15 µg/m³ and ±15% of reading @ 25 °C and 50% r.h.
Analog output signal, (terminal U2)	DC 0...10 V, linear, corresponding to 0...500 µg/m3

5.4 Connections

Interface	
Micro USB	Power connection for display only

Wiring connections	
Screw terminals	Solid wires or prepared stranded wires: 0.4...1.5 mm²
Slotted screws	Size 1, tightening torque 0.6 Nm (0.44 lb-ft).
Wiring lengths for signals.	600 meters

5.5 Housing protection class

Degree of protection of housing	IP30

5.6 Operation conditions

Temperature	0…50 °C
Humidity	5...95% r.h. (no condensation)

5.7 Storage and transportation conditions

Temperature	-20…70 °C
Humidity	0…95% r. h. (no condensation)

5.8 Standards

Electromagnetic compatibility	CE standard EN 60730-1
Immunity	EN 61 000-6-2
Emissions	EN 61 000-6-3
EU conformity declaration	A6V11277342 *)

*) The document can be downloaded at http://siemens.com/bt/download.

5.9 General data

Color	White
Weight	140 g

5.10 Display (QSA2700D)

| Screen	Color, no touch
Working status	Only active when people in front within 1 m (±10%); screen turns off after a few minutes if no presence is detected
Resolution	1 µg/m^3 increments
Display	Display PM2.5 value (if value > 500 µg/m^3, then display 500+ µg/m^3)
	Air Quality Index corresponding to measured PM2.5 value
Language (selectable)	English, Chinese (simplified), German, French

6 Maintenance

6.1 Replacing AQS2700

Replace the sensor module due to:

● Reaching its end of lifetime: as indicated via LED or LCD, and output signal. Refer to Troubleshooting [➜ 21] for the indication.

● The measurement is not as accurate as specified. The sensor still works but is indicated via LED or LCD. Refer to Troubleshooting [➜ 21] for the indication.

Sensor module accuracy is influenced by ambient environment. We recommend to replacing the module every 1 to 3 years depending on the local environment. In environments with continuously high PM2.5 concentrations (i.e. greater than 300 µg/m³, e.g. a smoking room), replace the module more often.

To replace the sensor module:

1. Detach the housing from the mounting plate using a screw driver.
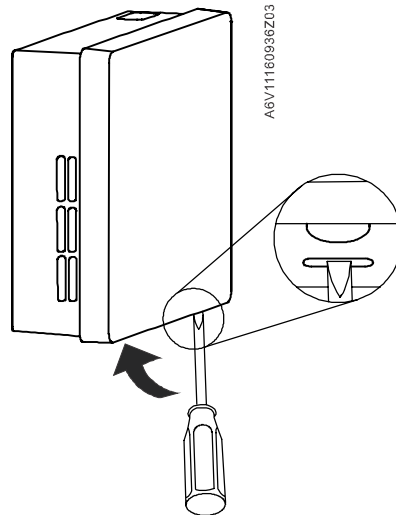
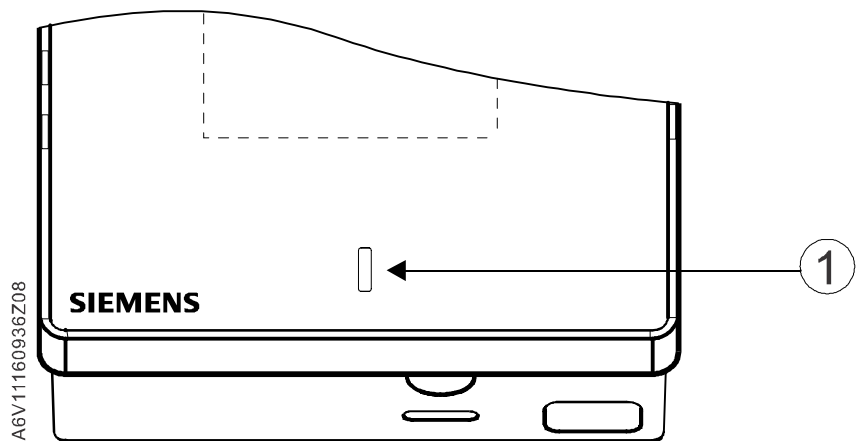2. Take off the module by hand and replace it with a new one.
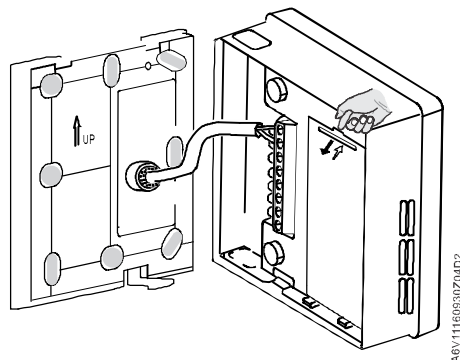
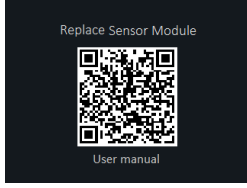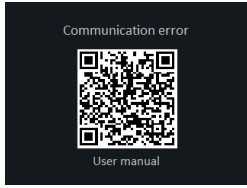| !	*NOTICE*
	Turn off the device before replacing the sensor module.
	If not possible, insert a new sensor module 10 s after the old one is removed.

6.2   Proximity sensor (QSA2700D)
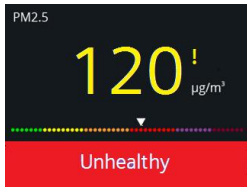
QSA2700D includes a built-in proximity sensor and enters into energy efficient mode if no person is detected in front of the sensor (approximately 1 m) over the past few minutes. In energy efficient mode, the screen is off and the sensor is working and transmitting the signals at regular intervals. Otherwise, the screen is activated and the sensor is in continuous working mode.

Keep the proximity sensor area clean as dirt may affect the detection performance.

A6V11160936Z08

1	Proximity sensor

6.3   Troubleshooting

	Error	Description	0-10 V output	Modbus
QSA2700D	Replace Sensor Module [QR code] User manual	Replace sensor module when: 1. it is broken; 2. it reaches its lifetime.	Present 0 V (2 s) and 10 V (2 s) one by one in turn	Value of register 260 changes from 0 to 1
QSA2700D	Communication error [QR code] User manual	Check for: 1. the communication error between sensor module and product MCU; 2. missing sensor module.	Present 0 V (5 s) and 10 V(2 s) one by one in turn	Value of register 260 changes from 0 to 2
QSA2700D	PM2.5 $120^!$ µg/m³ Unhealthy	Warning of possible inaccurate measurement	Present the measured value	Value of register 260 remains 0 without change
QSA2700	Red permanently on	Error 1, replace sensor module	Present 0 V (2 s) and 10 V (2 s) one by one in turn	Value of register 260 changes from 0 to 1
QSA2700	Red flashing (0.5 s on / 0.5 s off)	Error 2, communication error	Present 0 V (5 s) and 10 V (2 s) one by one in turn	Value of register 260 changes from 0 to 2
QSA2700	Red / yellow flashing (0.5 s red / 0.5 s yellow)	Warning of possible inaccurate measurement	Present the measured value	Value of register 260 remains 0 without change

6.4   Disposal

[crossed-out wheelie bin symbol]	The device is considered electrical and electronic equipment for disposal in terms of the applicable European Directive and may not be disposed of as domestic garbage. • Dispose of the device through channels provided for this purpose. • Comply with all local and currently applicable laws and regulations.

7 Air Quality Index classes

The Siemens fine dust sensor QSA2700D displays:

- The PM2.5 reading in µg/m³
- The AQI (Air Quality Index)

The AQI is a number used by government agencies to communicate to the public how polluted the air currently is or a forecast of air quality.

The AQI category (good, moderate, unhealthy, etc.) is based on the AQI (see Table 1) and is represented by a range of colors (green = good, orange = poor, etc.).

In general, AQI is calculated based on multiple pollutants: PM2.5, PM10, ozone, NO2, SO2, and CO.

However, the AQI value is always based on the Individual Air Quality Index (IAQI) of the **main pollutant**. For example, PM2.5 is the main pollutant in China during the winter, and the locally reported AQI is the IAQI of PM2.5.

$$\text{Traditional AQI} = \max(\ IAQI\ (\ PM_{2.5}\ ),\ IAQI\ (\ PM_{10}\ ),\ IAQI\ (\ O_3\ ),\ IAQI\ (\ NO_2\ ),\ IAQI\ (\ SO_2\ )\ )$$

AQI is a non-dimensional value. In contrast, PM2.5 values have the dimensional unit µg/m³. Consequently, there is a numerical table to convert pollutant PM2.5 in µg/m³ to AQI. This is outlined in Table 1 where, for example, "AQI 1…50, Good" represents a different range of values of PM2.5 in the U.S. (1…12 µg/m³) and China (1…35 µg/m³)

These different conversions of PM2.5 to AQI, country by country, are reflected by different AQI classes. The sensor QSA2700D for PM2.5 recognizes three different classes that can be selected during product commissioning:

- Class I – U.S.
- Class II – China
- Class III – India

For European countries, we recommend selecting class I.

Table 1: AQI for U.S., China, and India

	US		China		India		
AQI	PM2.5 (µg/m³)	Category	PM2.5 (µg/m³)	Category	PM2.5 (µg/m³)	Category	AQI
1-50	1-12.0	Good	1-35	Good	0-50	Good	1-50
51-100	12.1-35.4	Moderate	36-75	Moderate	51-100	Satisfactory	51-100
101-150	35.5-55.4	Unhealthy for sensitive group	76-115	Unhealthy for sensitive group	101-250	Moderate polluted	101-200
151-200	55.5-150.4	Unhealthy	116-150	Unhealthy			
201-300	150.5-250.4	Very unhealthy	151-185	Very unhealthy	251-350	Poor	201-300
300+	250.5+	Hazardous	185+	Hazardous	351-430	Very poor	301-400
					430+	Severe	401-500

Further reference:

Europe: http://www.airqualitynow.eu/about_indices_definition.php

Real-time AQI worldwide: http://aqicn.org/map/world/

Real-time AQI Europe: http://aqicn.org/map/europe/

8 Standard compliance

1. The product complies with CE standard (EN 61000-6-2, EN 61000-6-3, EN 60730-1).
2. The product complies with the RoHS and RoHS CN standard.

9 Appendices

9.1 Cyber security disclaimer

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http://www.siemens.com/cert/en/cert-security-advisories.htm

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