SpaceLogic Sensors
SCD2 Series Air Quality Sensors – BACnet and Modbus

Product Description

SpaceLogic SCD2 Series Air Quality Sensors are duct mount all-in-one sensors for monitoring air quality. The device combines CO_2, temperature, humidity, VOC and particulate matter (PM) sensing into a single unit to ensure a building's optimum air quality and energy efficiency.

Each device is an active sensor that converts a measurement into BACnet MS/TP or Modbus RTU output.

As an integral part of Schneider Electric EcoStruxture™ Building Operation (EBO) software, the SCD2 protocol models' Ready-Connect feature enables a plug & play experience for easy integration and configuration.

Different models are available based on application requirements for lower-cost installations.

SCD2 is available with an LCD display option on select models (see Available Products, page 2).

Features

- Field calibratable, non-dispersive infrared CO_2 sensor
  - NDIR-based, dual-channel device compensates for drift and deterioration for high-accuracy output
- Solid state capacitive humidity sensor element recovers from 100% saturation
- Solid state temperature sensor providing high accuracy measurements
- Laser-scatter type PM sensor featuring innovative contamination resistance technology for highly accurate measurement of particulate matter
- Automatic Background Calibration for improved accuracy and field performance
- Easy to install:
  - Latch-on sensor cover
  - Screwless terminal block wiring with spring actuator
  - Rotating probe for best alignment with airflow
- Quick to commission with DIP switch selectable outputs:
  - BACnet, Modbus via RS-485
- 1% or 2% with NIST certificate, 2% RH module – replaceable in the field
- 2-point calibration certificate available for humidity and temperature or temperature-only replaceable module
- Key component for the LEED green building program and WELL Building Standard*

*Leadership in Energy and Environmental Design (LEED) is a registered trademark of the US Green Building Council. The WELL Building Standard is a trademark of the International WELL Building Institute in the United States and other countries..

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Available Products

Model Number	LCD	2% RH Sensor	Temp. Transmitter	NDIR CO2	VOC	PM
SCD2LP2AVP	X	X	X	X	X	X
SCD2LP2AVX	X	X	X	X	X	
SCD2LPXAVP	X		X	X	X	X
SCD2LPXAVX	X		X	X	X	
SCD2LPXXVX	X			X	X	
SCD2XP2AVP		X	X	X	X	X
SCD2XP2AVX		X	X	X	X	
SCD2XPXAVP			X	X	X	X
SCD2XPXAVX			X	X	X	

*Note: Replaceable RH and temperature modules available to be ordered separately per table below.

Replaceable RH Elements & Temperature and Humidity Calibration Modules

Model	Description	Temp. Calibration	RH Calibration
SLXRHS2N*	Replaceable RH sensor, 2% with NIST certificate	N/A	2-point calibration
SLXRHS2X	Replaceable RH sensor, 2%	N/A	2-point calibration
SLXRHS1N	Replaceable RH sensor, 1% with NIST certificate	N/A	2-point calibration
SLXXT2**	Replaceable temperature module with 2-point calibration certificate	2-point calibration	N/A
SLXRHT2**	Replaceable temperature and humidity module with 2-point calibration certificate	2-point calibration	2-point calibration

*Not for use with SHO2 Series outdoor humidity sensors.
**For use on temperature transmitter models only.
Note: For instructions on installing replaceable elements, see Z208536-0x, *Replacement Humidity and Temperature Sensors Installation Guide*.

Safety Information

Important Information

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special message may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

NOTICE

NOTICE is used to address practices not related to physical injury.

⚠WARNING

WARNING indicates a hazardous situation which, if not avoided **could result in** death or serious injury.

Please Note

Electrical equipment should be installed, operated, serviced and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has the skills and knowledge related to the construction, installation and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

Safety Precautions

⚠ WARNING

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions can result in death, serious injury or equipment damage.

This product is intended for use in HVAC and building environmental control applications.

It is not intended for direct medical monitoring of patients.

It is not designed for life-safety applications.

Read and understand these instructions before installing this product.

The installer is responsible for all applicable codes.

If this product is used in a manner not specified by the manufacturer, the protection provided by the product may be impaired. No responsibility is assumed by the manufacturer for any consequences arising out of the use of this material.

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Specifications

Operating and Storage Environment	
Operating temperature	0 to 50 °C (32 to 122 °F)
Operating humidity	0 to 95% RH (non-condensing)
Storage temperature	-25 to 70 °C (-13 to 158 °F)
Storage humidity	0 to 95% RH (non-condensing)
Power supply	3-wire volt mode: 20 to 30 Vdc, 24 Vac, 50 to 60 Hz
Output	BACnet MS/TP, Modbus RTU
Power consumption	See Maximum Power Consumption table, page 8
Tube length	200 mm
Medium	Neutral gas, air
Housing material	Polycarbonate; Flammability rating UL 94 V0
Mounting location	For indoor use only. Not suitable for wet locations.
IP rating	IP 65
Protection class	Class III
CO_2 Sensor	
Sensor type	Non-dispersive infrared (NDIR), diffusion sampling
Output range	0 to 10,000 ppm
Accuracy	±30 ppm ±3% of measured value
Repeatability	±20 ppm ±1% of measured value
Response time	<60 seconds for 90% step change
Calibration	Field calibration support
VOC Sensor Option	
Sensor type	Solid state
Accuracy	±15% sensor-to-sensor variation
AQI table	**Level** / **Ventilation Recommendation**
	>61% / Greatly increased
	20 to 61% / Significantly increased
	10 to 20% / Slightly increased
	5 to 10% / Average
	0 to 5% / Target value
RH Sensor Option	
Sensor type	Solid state capacitive, replaceable
Accuracy[1]	±2% from 10 to 80% RH @ 25 °C (77 °F) ±1%, ±2% replaceable models
Hysteresis	1.5% typical
Linearity	Included in accuracy specification
Stability	±1% @ 20°C (68 °F) annually for 2 years
Output range	0 to 100% RH
Temperature coefficient	±0.1% RH/°C above or below 25 °C (77 °F) typical

Temperature Sensor Option	
Sensor transmitter type	Solid state, integrated circuit
Time constant	Air velocity 1.5 m/s. approx. 72 s; Air velocity 3.0 m/s. approx. 52 s
Accuracy[2]	±0.2 °C (±0.4 °F) typical @ 25 °C
Resolution	0.1 °C (0.1 °F)
Range	0 to 50 °C (32 to 131 °F)
PM Sensor Option	
Sensor type	Laser-scatter
Particulate size	PM1.0, PM2.5, PM4.0, PM10
Resolution	± 1 µg/m³
Mass concentration output range	0 to 1000 µg/m³
Accuracy	PM1 and PM2.5: 0 to 100 µg/m³ +/-[5µg/m³+5% m.v.], 100 to 1000 ug/m³ +/-[10% m.v.] PM4 and PM10[3]: 0 to 100 µg/m³ +/-[25µg/m³], 100 to 1,000 µg/m³ +/-[25% m.v.] (sensor-to-sensor deviation)
Display Models	
LCD type	Positive display with backlight
Measurement values displayed	CO_2: ppm Temperature: °C or °F Humidity: % RH VOC: % AQI PM: µg/m³
Display resolution	CO_2: 1 ppm Humidity: 0.1% RH Temperature: 0.1 °C or °F VOC: 1% AQI PM: 1 µg/m³
Wiring	
Wiring	Screwless terminal block with spring actuator, 16-24 AWG
EBO integration[4]	Download Modbus Device Type template for Modbus models from the Building Application tool.
Warranty	
Limited warranty	2 years
Regulatory Information	
Agency approvals	UL 916, European conformance CE: EN 60730-1, EN 61000-6-2, EN 61000-6-3, EN 61000 Series - Industrial Immunity, EN 61326-1 FCC Part 15 Class A Green Premium (REACH, RoHS), RoHS 2 (China), RCM (Australia), ICES-003 (Canada), UKCA (UK), EAC (Russia)

1. Humidity sensor measurement uncertainty should include: accuracy, hysteresis, temperature coefficient and stability.
2. ±0.5 °C over full operating range.
3. PM4 and PM10 output values are calculated based on the distribution profile of all measured particles.
4. See http://bms-applications.schneider-electric.com/type/MB/download/263 for device import file and instructions.

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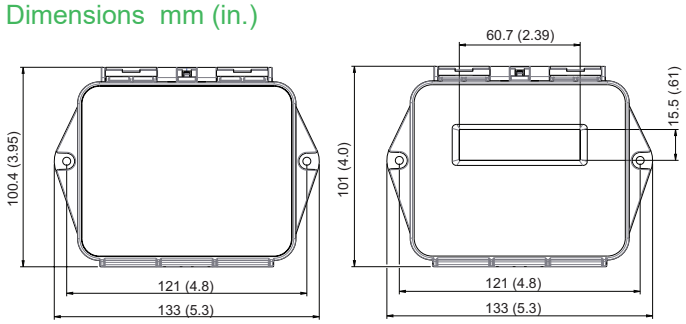
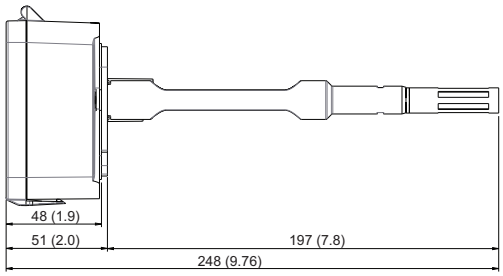
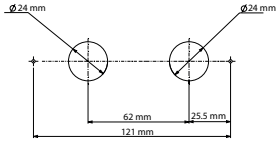
Dimensions mm (in.)

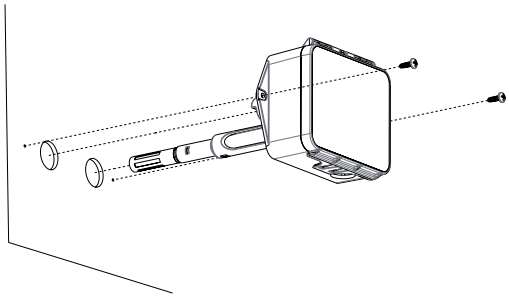




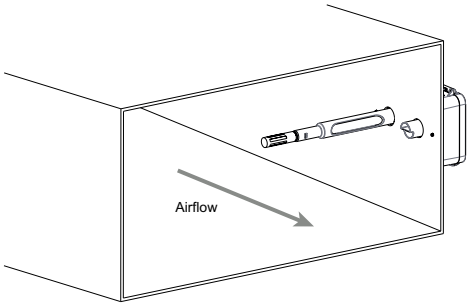
Installation

1. Prepare the duct for installation by drilling holes to accommodate the probe tubes for the PM sensor and CO_2/VOC intake. Ensure the gasket on the back is depressed to prevent leakage between the product and the duct. Do not over-tighten the screws.

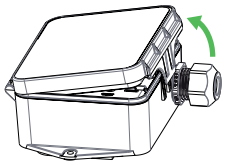


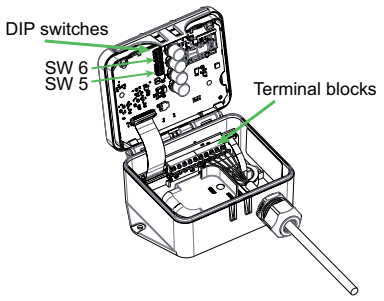


2. Ensure the probes are installed in the direction of the air flow. Install the probe in the middle of the duct and away from any restrictions to allow proper air flow.



3. Release the latch on the lid to access the DIP switches and terminal block.





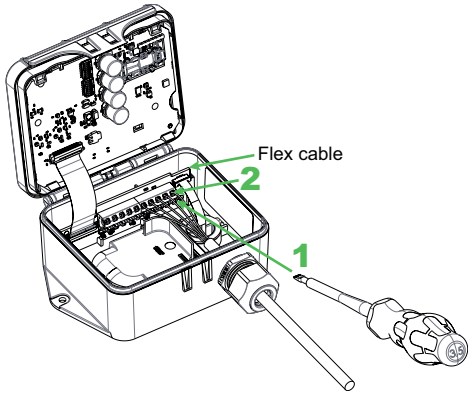
4. Wire the connections according to the diagram in the Wiring section. This device features spring terminals for screwless termination. Open the terminal point by inserting a screwdriver, then insert the wire above. Release the screwdriver to hold the wire in place. Details on wiring and configuration are contained in the next sections of this document.

NOTICE

MISSING TEMPERATURE & HUMIDITY READINGS

- Ensure flex cable is in place after wiring.

Failure to follow these instructions can result in no temperature or humidity readings.



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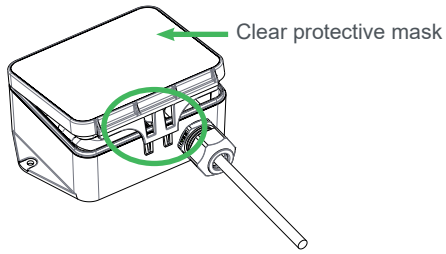
Installation (cont.)

5. Secure the latch-on cover in the closed position and remove the clear protective mask on the front label of the device.



Wiring

NOTICE

PRODUCT DAMAGE DUE TO ELECTRO-STATIC DISCHARGE

Circuit boards and components can be damaged by static electricity or electro-static discharge (ESD). Observe the following electro-static precautions when handling this product and cables and components connected to the product.

- Keep static-producing material such as plastic, upholstery, carpeting, etc. out of the immediate work area.
- Store the product in ESD-protective packaging when it is not installed in the panel
- When handling the product or a conductive cable/ESD-sensitive component connected to the product, wear a conductive wrist strap connected to ground through a minimum of 1 MΩ resistance
- Do not touch exposed conductors and component leads with skin or clothing.

Failure to follow these instructions can result in equipment damage.

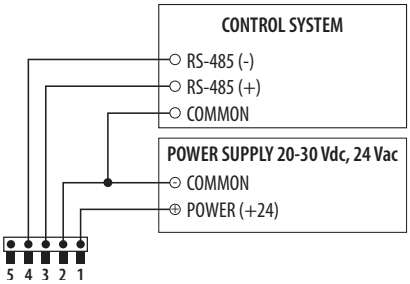
NOTICE

INACCURATE READINGS

- Do not run wiring in the same conduit as AC power wiring. Close proximity to AC power may influence accuracy.

Failure to follow these instructions can result in reduced accuracy

Wiring Diagram

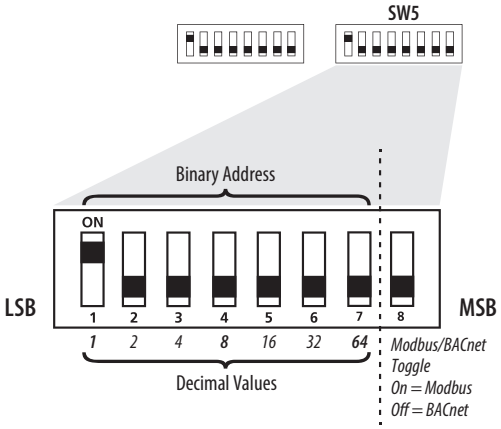


Configuration

Address Configuration

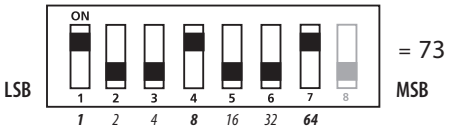
Each device on a single network must have a unique address. Set the DIP switch labeled “ADDRESS” to assign a unique address before the device is connected to the network. If an address is selected that conflicts with another device, neither device will be able to communicate.

Address the device as any whole number between and including 1 to 127. Note that zero is not a valid address for Modbus; zero is a valid address for BACnet. Positions 1 through 7 of the “ADDRESS” DIP switch designate the address. Position 8 toggles between the Modbus and BACnet communication protocols, as shown in the diagram below. This is the right bank of DIP switches on the sensor.



To set an address using the DIP switch, simply add the values of any switches that are in the ON position.

For example, an address of 73 is set as shown in the diagram below.



Position number 1 has an ON value of 1, position number 4 has an ON value of 8 and position number 7 has an ON value of 64 (1 + 8 + 64 = 73).

Communications Configuration

See the Installation section, Step 3 for the location of the DIP switch. The following parameters are configurable:

- Parity (Modbus only): None, Odd, None1 (one stop bit), Even
- Baud rate: 9600, 19200, 38400, 57600 (Modbus), 76800 (BACnet)

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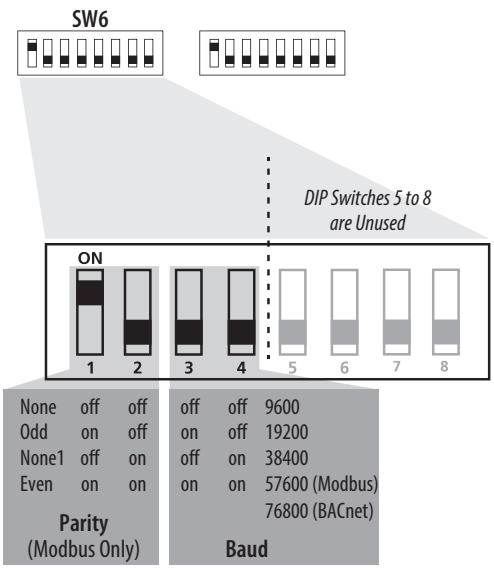
Configuration (cont.)



Example: No Parity, 19200 Baud

1	2	3	4	5	6	7	8
off	off	on	off	off	off	off	off
None		19200 Baud		Unused			

Modbus Point Map

Function Codes:

Function Code	Function
03	Read holding (RW) registers
04	Read input (RO) registers
06	Write single register*
16	Write multiple registers
01	Read coils
05	Write single coil
15	Write multiple coils

* Not supported.

All of these values correspond to BACnet objects with the same name. See the BACnet Conformance Statement for their definitions.

Note that an attempt to write to “read only” holding registers will give an error and the entire write command will not be executed even if writing to read/write locations were also requested. Exception code 2 is given in this case. “Preserved” means the values is maintained through power outages.

32-Bit Input Registers (Read Only):

16-Bit Register Location	Description	Format
1	Temp reading	32-bit floating point
2		
3	Humidity reading	32-bit floating point
4		
5	CO2 reading	32-bit floating point
6		
7	VOC reading	32-bit floating point
8		
9	Model number	5x16-bit ASCII characters as a single query
10		
11		
12		
13		
14~41	Unused	NA
42	Serial number	4x16-bit ASCII characters as a single query
43		
44		
45		
46-47	PM1 reading	32-bit integer
48-49	PM2.5 reading	
50-51	PM4 reading	
52-53	PM10 reading	

32-Bit Holding Registers (Read/Write):

16-Bit Register Location	Description	Format
7~39	Device name	4x16-bit ASCII characters as a single query

Note: All holding registers are preserved during power outages.

Coils (Read/Write)

Register	Description
4*	Invoke CO_2 calibration
5*	Sets display (only) temperature units (1 = °F, 0 = °C)
11	Triggers the CO_2 FRC 400 command

*Preserved during power outages.

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BACnet Descriptions

Note: In the tables below, all properties are read-only unless otherwise noted. “Preserved” means the value is maintained through power outages.

Present_Value Range Restrictions

Object Name	Minimum Value	Maximum Value
DEV - Object_ Name	1 Character	65 Characters
Device_Instance	0	4,194,302

Standard Object Types Supported

Object Type	Supported Optional Properties	Writable Properties
Analog Input - AI	Reliability	None
Binary Value - BV	None	Present Value
Device - DEV	Max Info Frames Max_Master	APDU_Timeout Max_Master Object_Name

Objects Table

Object Name	Object Identifier	Object Property
Room Temperature	AI 1	Temperature in room (°C)
Room Humidity	AI 2	Humidity in room
CO2 Sensor	AI 3	CO_2 concentration
VOC Sensor	AI 4	VOC level
PM1 Sensor	AI 5	PM1.0 level
PM2.5 Sensor	AI 6	PM2.5 level
PM4 Sensor	AI 7	PM4.0 level
PM10 Sensor	AI 8	PM10.0 level
CO2 ABC Cal	BV3	ACTIVE enables ABC calibration INACTIVE disables ABC calibration
Temperature Units*	BV4	ACTIVE displays temperature in Fahrenhiet INACTIVE displays temperature in Celsius
CO2 FRC 400	BV10	ACTIVE sets 400 ppm as CO_2 baseline after Present_Value is read INACTIVE leaves CO2 baseline in last state (no action)

*Applicable to LCD models only.

Device Objects Table

Object Name	Object Identifier	Object Property	Descrip.
Plant Room Units XXXXXXXX	Vendor_ID + nnn	Object _Identifer (R/W)	Unique value where nnn initially is the MS/TP address

BACnet Protocol Implementation Conformance Statement

Vendor Name: Schneider Electric

Product Name: Plant Room Air Quality Unit

Product Model: SCD2XPXXXX

BACnet Protocol Version: 1

BACnet Protocol Revision: 16

Product Description: Environmental Sensor

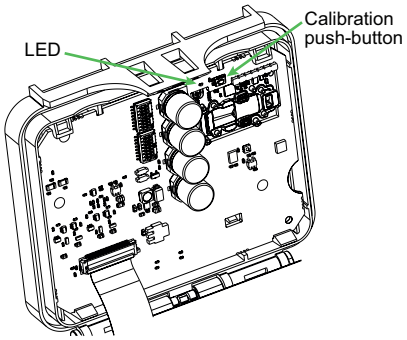
BACnet Standardized Device Profile (AnnexL): BACnet Application Specific Controller (B-ASC)

CO_2 Sensor Calibration

There are two methods for CO_2 calibration available: 400 ppm baseline calibration and automatic baseline calibration (ABC).

400 ppm Baseline Calibration

400 ppm baseline calibration allows the sensor to be set at 400 ppm. Push and hold the calibration button for 3 to 5 seconds. The LED will flash green. Once the button is released, calibration is complete and the LED switches off.



Automatic Baseline Calibration (ABC)

The ABC mode addresses the 400 ppm calibration. It allows turning on or off a background correction/recovery mode that will minimize any calibration error that has been caused by shock during handling and transportation or is caused by a long term shift in measurement. The ABC algorithm constantly keeps track of the sensor’s lowest reading over a preconfigured time interval and slowly corrects for any long-term drift detected as compared to the expected fresh air value of 400 ppm. After initial startup, it is expected that the sensor reaches specified accuracy after 7 to 21 days.

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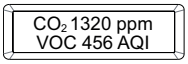
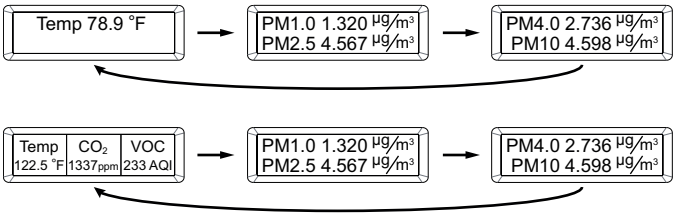
LCD Operation

The screen displays sensor values for CO_2, PM, VOC (if equipped), RH (if equipped), temperature and Celsius/Fahrenheit.

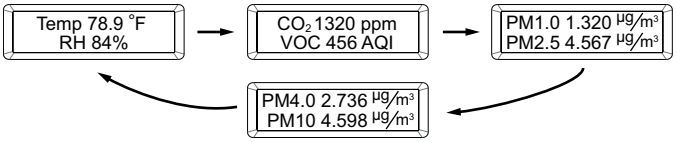
Single-Screen Operation



3-Screen Operation



4-Screen Operation



Maximum Power Consumption

Series	LCD	CO_2/ VOC	PM	Temp./ RH	Max. Power
SCD2 Protocol	Yes	Yes	Yes	Yes	4VA @ 24VAC
	Yes	Yes	No	Yes	3VA @ 24VAC
	No	Yes	Yes	Yes	2VA @ 24VAC
	Yes	Yes	No	Yes	1.5VA @ 24VAC

China RoHS Compliance Information

Environment-Friendly Use Period (EFUP) Table

部件名称	有害物质 - Hazardous Substances					
Part Name	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr (VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
电子件 Electronic	X	O	O	O	O	O

本表格依据SJ/T11364的规定编制。
O: 表示该有害物质在该部件所有均质材料中的含量均在GB/T 26572规定的限量要求以下。
X: 表示该有害物质至少在该部件的某一均质材料中的含量超出GB/T 26572规定的限量要求。
（企业可在此处，根据实际情况对上表中打 "X" 的技术原因进行进一步说明。）

This table is made according to SJ/T 11364.
O: indicates that the concentration of hazardous substance in all of the homogeneous materials for this part is below the limit as stipulated in GB/T 26572.
X: indicates that concentration of hazardous substance in at least one of the homogeneous materials used for this part is above the limit as stipulated in GB/T 26572

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