



## Particulate Matter Transmitter

*with Temperature & Humidity options*

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### Features

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- Maintenance-free, fully factory calibrated laser optic sensor
- PM1.0, PM2.5, PM4.0 and PM10 measurements
- Estimated lifetime more than 10 years
- Humidity & Temperature options
- Analog outputs as 4-20 mA and 0...10 Vdc
- Operating voltage 24V AC/DC

### Options

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- Display, custom design
- Modbus RTU, RS485 protocol
- Relay, 1 or 2 relays, can be set individually
- Buzzer can be set individually
- PID, RTC and Datalogger advanced options for special applications

### Applications

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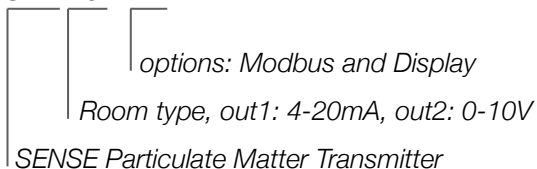
- Indoor air quality monitoring
- Cleanroom monitoring

## Ordering Codes

only Particulate Matter

model	mounting	output 1 - PM	output 2 - PM	options	advanced options
SPM	R room	<b>0</b> no output <b>1</b> 0...10 Vdc <b>2</b> 2...10 Vdc <b>3</b> 0...5 Vdc <b>4</b> 1...5 Vdc <b>5</b> 4...20 mA	<b>0</b> no output <b>1</b> 0...10 Vdc <b>2</b> 2...10 Vdc <b>3</b> 0...5 Vdc <b>4</b> 1...5 Vdc <b>5</b> 4...20 mA	<b>M</b> modbus <b>D</b> display <b>R</b> relay 1x <b>RR</b> relay 2x <b>B</b> buzzer	<b>P</b> PID out <b>C</b> RTC <b>L</b> Datalogger

sample order code: SPM.R51 .MD

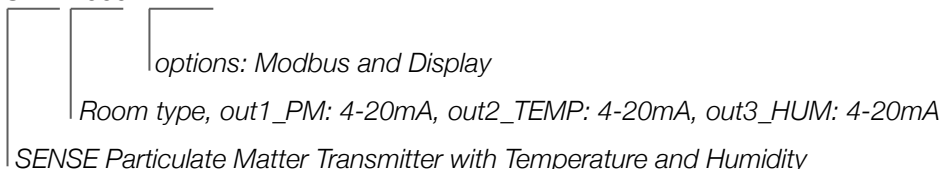


## Ordering Codes

Particulate Matter with Temp. & Hum.

model	mounting	out 1 - PM	out 2 - TEMP.	out 3 - HUM.	fixed	options	advanced
SPM	R room	<b>0</b> no output <b>1</b> 0...10 Vdc <b>2</b> 2...10 Vdc <b>3</b> 0...5 Vdc <b>4</b> 1...5 Vdc <b>5</b> 4...20 mA	<b>0</b> no output <b>1</b> 0...10 Vdc <b>2</b> 2...10 Vdc <b>3</b> 0...5 Vdc <b>4</b> 1...5 Vdc <b>5</b> 4...20 mA	<b>0</b> no output <b>1</b> 0...10 Vdc <b>2</b> 2...10 Vdc <b>3</b> 0...5 Vdc <b>4</b> 1...5 Vdc <b>5</b> 4...20 mA	TH temp. + hum.	<b>M</b> modbus <b>D</b> display <b>R</b> relay 1x <b>RR</b> relay 2x <b>B</b> buzzer	<b>P</b> PID out <b>C</b> RTC <b>L</b> datalogger

sample order code: SPM.R555 .THMD











1. Relay and Buzzer options should have to be ordered with Display option
2. For advanced options and special applications, please contact us [info@senseandcontrol.com](mailto:info@senseandcontrol.com)

## General Notes

1. High density of some other gasses may affect the measurements.
2. Observe maximum permissible cable lengths.
3. If cable runs parallel to the mains cable: Use shielded cables.
4. The data indicated under 'Technical Data' apply only to vertically mounted transmitters.
5. Room type transmitters should have to be mounted in the center of wall but not near to any doors and windows.

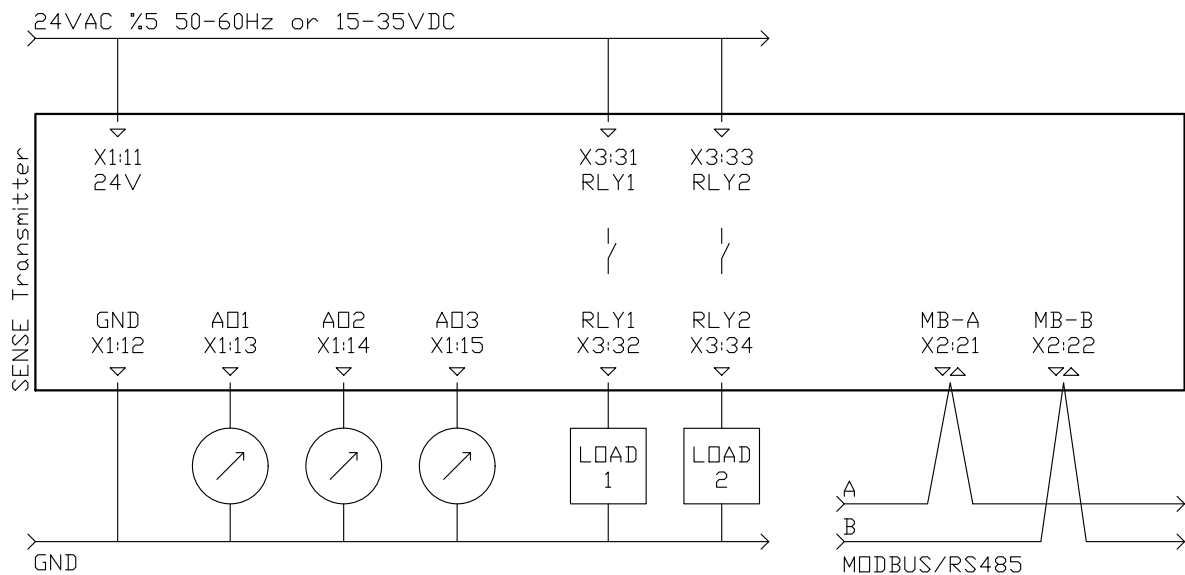
## DIP Switch Settings

1. Please check if there is any special instruction on the enclosure or inside the cover
2. Temperature range is fixed as 0...50°C
3. Humidity range is fixed as 0...100%RH

DIP	Particle Size	DIP	Concentration Range	Response
	0.3 ... 2.5 µm		0 ... 100 µg/m³	60 sec.
	0.3 ... 1.0 µm		0 ... 100 µg/m³	10 sec.
	0.3 ... 4.0 µm		0 ... 500 µg/m³	60 sec.
	0.3 ... 10 µm		0 ... 500 µg/m³	10 sec.

## Electrical Connections

1. Please be sure about current direction for current outputs and polarity for voltage outputs.
2. Relay contact is Normally Open and rating is max. 1A at 230VAC
3. We kindly advise using 24V for avoiding high voltage harmonics and external power relay for bigger loads
4. Please use shielded and twisted paired cables for Modbus connections
5. Please observe RS485 termination rules, max. 32 devices in a single Modbus line is advised

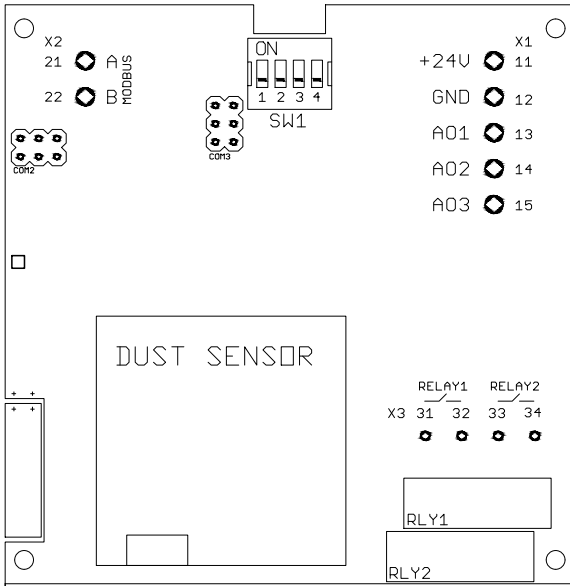


## Technical Data

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Electrical	Power Supply	AC 24V ( $\pm$ %5), 50-60 Hz DC 15...35 V
	Power Consumption	< 3 W
Outputs	Current Output	4...20 mA, maximum 500 $\Omega$
	Voltage Output	0...10 Vdc, minimum 1.000 $\Omega$ 0...5 Vdc, minimum 1.000 $\Omega$
	Relay Output	max. rating 1A @ 220 Vac
Accuracy	PM1.0 - PM2.5	10 $\mu\text{g}/\text{m}^3$
	PM4.0 - PM10	25 $\mu\text{g}/\text{m}^3$
	Humidity	3%rH
	Temperature	0.5°C
Sensor	type	laser optic
	media	air or non aggressive gasses
	life	more than 10 years, continuous working
	storage temperature	-30...70°C
operating temperature	-10...+60°C	
Particle Sizes	PM 1.0	0.3 ... 1.0 $\mu\text{m}$
	PM 2.5	0.3 ... 2.5 $\mu\text{m}$
	PM 4.0	0.3 ... 4.0 $\mu\text{m}$
	PM 10	0.3 ... 10 $\mu\text{m}$
Ranges	PM	0 ... 100 $\mu\text{g}/\text{m}^3$ , 0 ... 500 $\mu\text{g}/\text{m}^3$
	Temperature	0...50°C
	Humidity	0...100 %rH
Connections	X1-X2 Terminals	Pluggable screw terminal
	X3 Terminals	Fixed screw terminal
	Cable	maximum 1.5mm <sup>2</sup>
Protection	SPM series	IP41 or NEMA 3
Standards	EMC Directive	EN 61326-1
Dimensions	SPM series	86.0 x 86.0 x 30.7 mm
Weight Packed	SPM series	125 gr

# Transmitter Hardware



**SW1** DIP Switch for configuration range and response time

## X1 TERMINAL

<b>11</b>	24V	15...35 Vdc or 24 Vac (± %5, 50-60 Hz)
<b>12</b>	GND	ground for power and reference for outputs
<b>13</b>	AO1	analog output 1
<b>14</b>	AO2	analog output 2
<b>15</b>	AO3	analog output 3

## X2 TERMINAL

<b>21</b>	A / RS485	modbus communication positive pair
<b>22</b>	B / RS485	modbus communication negative pair

**TR1** not used

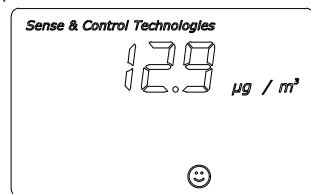
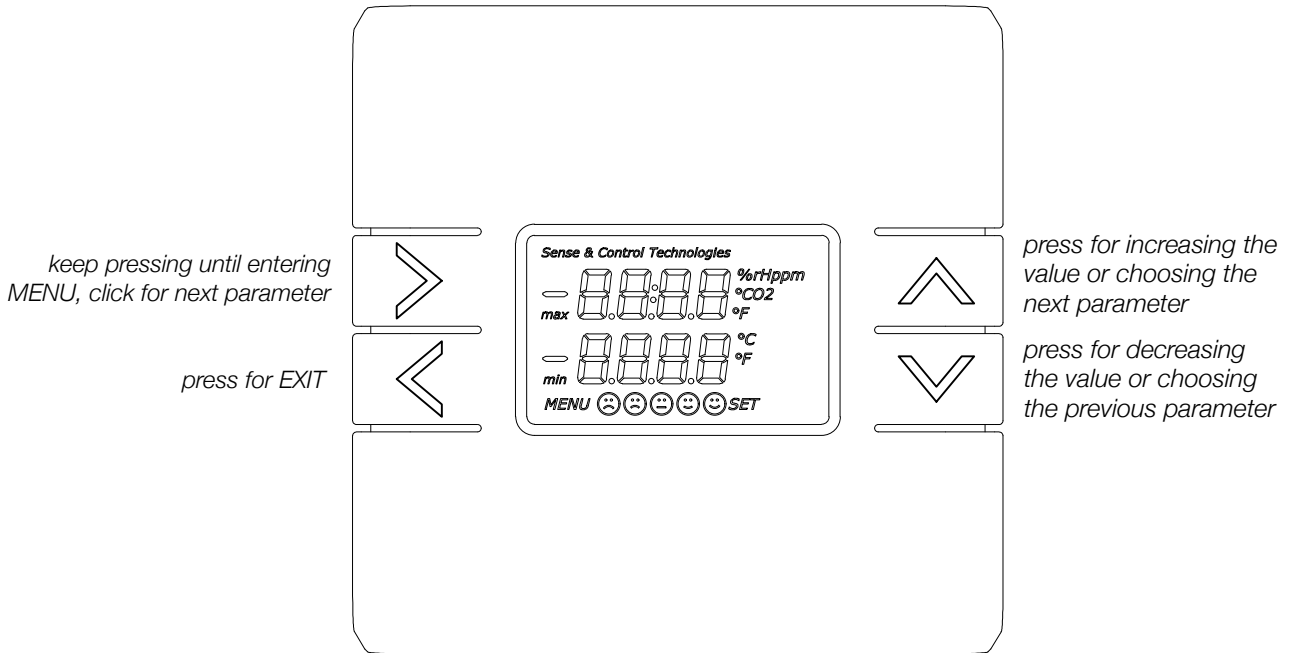
**TR2** not used

**RLY1 & RLY2** relay 1 and relay 2

## X3 TERMINAL

<b>31</b>	NO - RL1	relay 1 dry contact max. rating 1A @ 220 Vac
<b>32</b>	NO - RL1	relay 1 dry contact max. rating 1A @ 220 Vac
<b>33</b>	NO - RL2	relay 2 dry contact max. rating 1A @ 220 Vac
<b>34</b>	NO - RL2	relay 2 dry contact max. rating 1A @ 220 Vac

# Display & Buttons



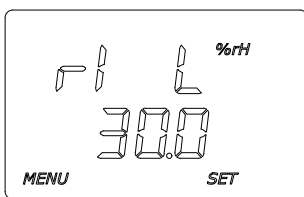
main screen  
transmitter is working



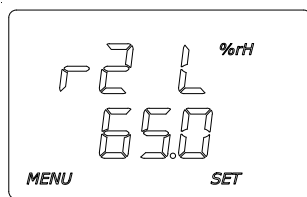
keep pressing MENU button until seeing SET  
transmitter is not working in MENU mode

## Parameters for Relay & Buzzer

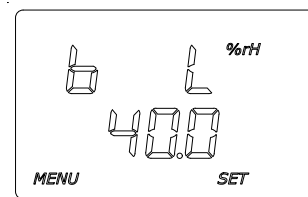
Main Screen >>>>> r1 L > r1 H > r1 A > r2 L > r2 H > r2 A > BL > BH > BA > Main Screen



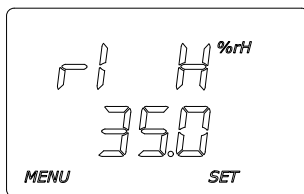
LOW set point for Relay 1



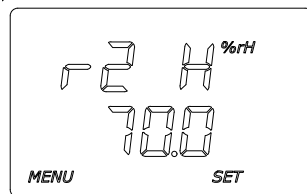
LOW set point for Relay 2



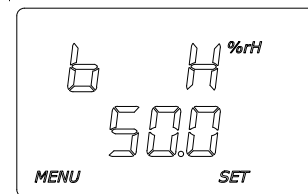
LOW set point for Buzzer



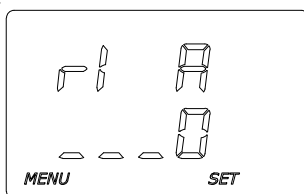
HIGH set point for Relay 1



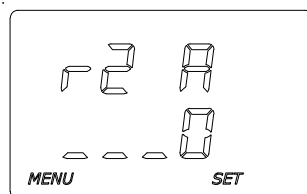
HIGH set point for Relay 2



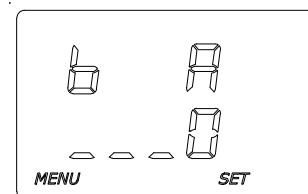
HIGH set point for Buzzer



ACTION selection for Relay 1



ACTION selection for Relay 2

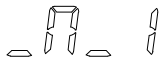


ACTION selection for Buzzer

## Actions for Relay & Buzzer



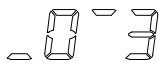
action 0, valid for relays and buzzer,  
 relay contact is always OPEN  
 buzzer is always SILENCE



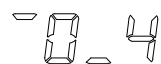
action 1, valid for relays and buzzer,  
 relay contact is CLOSED between points, OPEN under LOWpoint and OPEN over HIGHpoint  
 buzzer is WARNING between points, SILENCE under LOWpoint and SILENCE over HIGHpoint



action 2, valid for relays and buzzer,  
 relay contact is OPEN between points, CLOSED under LOWpoint and OPEN over HIGHpoint  
 buzzer is SILENCE between points, WARNING under LOWpoint and SILENCE over HIGHpoint



action 3, valid for relays and buzzer,  
 relay contact is CLOSED over HIGHpoint, OPEN under LOWpoint, hysteresis between points  
 buzzer is WARNING over HIGHpoint, SILENCE under LOWpoint, hysteresis between points



action 4, valid for relays and buzzer,  
 relay contact is OPEN over HIGHpoint, CLOSED under LOWpoint, hysteresis between points  
 buzzer is SILENCE over HIGHpoint, WARNING under LOWpoint, hysteresis between points



action 5, valid only for buzzer,  
 buzzer is WARNING over HIGHpoint, SILENCE under LOWpoint,  
 buzzer is WARNING intermittently between points,



action 6, valid only for buzzer,  
 buzzer is WARNING under LOWpoint, SILENCE over HIGHpoint,  
 buzzer is WARNING intermittently between points,



action 7, valid only for buzzer,  
 buzzer is following relay 1 contact,  
 buzzer is WARNING when relay 1 contact is CLOSED, SILENCE when the contact is OPEN



action 8, valid only for buzzer,  
 buzzer is following relay 2 contact,  
 buzzer is WARNING when relay 2 contact is CLOSED, SILENCE when the contact is OPEN

ACTIONS	under LOW	between LOW & HIGH	over HIGH
0 : 0.0.0	Open / Silence	Open / Silence	Open / Silence
1 : 0.l.0	Open / Silence	Closed / Warning	Open / Silence
2 : l.0.l	Closed / Warning	Open / Silence	Closed / Warning
3 : 0.X.l	Open / Silence	Hysteresis	Closed / Warning
4 : l.X.0	Closed / Warning	Hysteresis	Open / Silence
5 : 0.-.l	Silence	Pre Alarm	Warning
6 : l.-.0	Warning	Pre Alarm	Silence
7 : =r1	Silence when RL1 is Open, Warning when RL1 is Closed		
8 : = r2	Silence when RL2 is Open, Warning when RL2 is Closed		

0 : Relay Contact is OPEN, Buzzer is in Silent mode

l : Relay Contact is CLOSED, Buzzer is in Warning mode

X : Relay Contact is at HYSTERESIS position, OPEN if previous position open, CLOSED if previous position closed

: Buzzer is in HYSTERESIS mode, Silent if previous mode is silent, Warning if previous mode is warning

- : Buzzer is in PRE ALARM mode, Buzzer is warning intermittently

## Modbus RS485 Protocol

Default Settings: Modbus ID:1, 9600, 8bit, None, 1. Register Table starts from Base 1.

Use Function 3 for Reading and Function 6 for Writing Holding Registers. Whenever writing to any Modbus Parameter, new parameter is activated instantly and you should have to configure master device according to new parameters. For every reboot/initializing, Modbus is activated with default parameters for 3 seconds. After 3 seconds, Modbus is reconfigured according your parameter settings.

Register	R/W	Range	Description
1	R & W	1...254	Modbus Address
2	R & W	0...4	Baudrate, 0: 9.600, 1: 19.200
3	R & W	0...3	Bit_Parity_Stop, 0: 8bit_None_1, 1: 8bit_None_2, 2: 8bit_Even_1, 3: 8bit_Odd_1
4	R		PM2.5 x10, divide by 10 for exact value
5	R		PM10 x10, divide by 10 for exact value
6	R	0 or 1	Relay 1, contact position, 0: OFF - Contact is Open, 1: ON - Contact is Closed
7	R	0...1.000	Relay 1, LOW point
8	R	0...1.000	Relay 1, HIGH point
9	R	0...4	Relay 1, ACTION
10	R	0 or 1	Relay 2, contact position, 0: OFF - Contact is Open, 1: ON - Contact is Closed
11	R	0...1.000	Relay 2, LOW point
12	R	0...1.000	Relay 2, HIGH point
13	R	0...4	Relay 2, ACTION
14	R	0 or 1	Buzzer, 0: OK-Silence, 1: PreAlarm - warning intermittently, 2: WARNING continuously
15	R	0...1.000	Buzzer, LOW point
16	R	0...1.000	Buzzer, HIGH point
17	R	0...4	Buzzer, ACTION
18-30	X		only for service needs, do not change any parameter..!
31	R		Temperature as C x10, divide by 10 for exact value
32	R		Temperature as C
33	R		Temperature as F x10, divide by 10 for exact value
34	R		Temperature as F
35	R		Humidity as %rH x10, divide by 10 for exact value
36	R		Humidity as %rH
37-40	X		blank
41	R	0...10.000	PM1.0 x10, divide by 10 for exact value
42	R	0...10.000	PM2.5 x10, divide by 10 for exact value
43	R	0...10.000	PM4.0 x10, divide by 10 for exact value
44	R	0...10.000	PM10 x10, divide by 10 for exact value
45	R	0...1.000	PM 1.0
46	R	0...1.000	PM 2.5
47	R	0...1.000	PM 4.0
48	R	0...1.000	PM 10



## PM2.5 & Indoor Air Quality Index

The table below will give you a sense of what levels of PM2.5 are harmful and the appropriate precautions you need to take. It is based on the indoor air quality standards for particle pollution published by the U.S. Environmental Protection Agency.

PM 2.5	IAQ Index	IAQ Category	PM2.5 Health Effect	Precautionary Actions
0.0 ... 12.0	0 ... 50	Good	Little to no risk.	None
12.0 ... 35.4	51 ... 100	Moderate	Unusually sensitive individuals may experience respiratory symptoms.	Unusually sensitive people should consider reducing prolonged or heavy exertion.
35.5 ... 55.4	101...150	Unhealthy for Sensitive Group	Increasing likelihood of respiratory symptoms in sensitive individuals, aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly.	People with respiratory or heart disease, the elderly and children should limit prolonged exertion.
55.5 ... 150.4	151...200	Unhealthy	Increased aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; increased respiratory effects in general population.	People with respiratory or heart disease, the elderly and children should avoid prolonged exertion; everyone else should limit prolonged exertion.
150.5...250.4	201...300	Very Unhealthy	Significant aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; significant increase in respiratory effects in general population.	People with respiratory or heart disease, the elderly and children should avoid any outdoor activity; everyone else should avoid prolonged exertion.
250.5 ... 500	301...500	Hazardous	Serious aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; serious risk of respiratory effects in general population.	Everyone should avoid any outdoor exertion; people with respiratory or heart disease, the elderly and children should remain indoors.

Source: U.S. Environmental Protection Agency

Drawings

