HPM Series
Particle Sensor

32322550
Issue C

FEATURES
- Laser-based light scattering particle sensing
- Concentration range: 0 µg/m^3 to 1,000 µg/m^3
- Fully calibrated
- EMC: Heavy industrial level IEC61000
- Response time: <6 s
- Supply current: 80 mA max.
- Output signal: UART (Universal Asynchronous Receiver/Transmitter)
- PM2.5 output (PM10 output optional)
- RoHS compliant
- REACH compliant

DESCRIPTION
The Honeywell HPM Series Particle Sensor is a laser-based sensor which uses the light scattering method to detect and count particles in the concentration range of 0 µg/m^3 to 1,000 µg/m^3 in a given environment. A laser light source illuminates a particle as it is pulled through the detection chamber. As particles pass through the laser beam, the light source becomes obscured and is recorded on the photo or light detector. The light is then analyzed and converted to an electrical signal to calculate concentrations in real time. The Honeywell particle sensor provides information on the particle concentration for given particle concentration range.

VALUE TO CUSTOMERS
- Enables the ability to more accurately and cost-effectively monitor or control environmental particulate
- Industry-leading long life of 20,000 hours of continuous use essentially equates to seven years of product life (based on eight hours of operation per day)
- Proven EMC performance enables the ability to perform more accurately in a variety of tough industrial environments
- Ultra-fast response time of <6 s allows the HPM Series to respond to environmental conditions in real time
- Enhanced reliability allows for use in harsh environments

DIFFERENTIATION
- Industry-leading long life of 20,000 hours provides stable operation and continuous use
- Proven EMC performance, based on IEC61000 stable operation, ±15% accuracy

POTENTIAL INDUSTRIAL APPLICATIONS
- HVAC:
  - Air conditioners
  - Air quality monitors
  - Environmental monitoring
- Consumer products:
  - Air cleaners
  - Air conditioners
  - Air purifiers
  - Car air cleaners
  - Handheld air quality detectors

Sensing and Internet of Things

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Table 1. Specifications

Characteristic	Parameter
Operating principle	laser scattering
Detection[1,2]	PM2.5 and PM10
Output data[1,2]	PM2.5 in $\mu g/m^3$ and PM10 in $\mu g/m^3$
Concentration range	0 $\mu g/m^3$ to 1,000 $\mu g/m^3$

Accuracy (at 25°C ±5°C):
    0 $\mu g/m^3$ to 100 $\mu g/m^3$
    100 $\mu g/m^3$ to 1000 $\mu g/m^3$
	
	 ±15 $\mu g/m^3$
	 ±15 %

Response time	<6 s
Supply voltage	5 V ±0.2V
Standby current (at 25°C ±5°C)	<20 mA
Supply current (at 25°C ±5°C)	<80 mA

Temperature:
    operating
    storage
	
	 -10°C to 50°C [-14°F to 122°F]
	 -30°C to 65°C [-22°F to 149°F]

Humidity (operating and storage)	0 %RH to 95 %RH non-condensing
Output protocol[3]	UART; baud rate: 9600, databits: 8, stopbits: 1, parity: no

Operating time:
    continuous mode
    intermittent mode
	
	 20,000 hr
	 depends on duty cycle

ESD	±4 kV contact, ±8 kV air per IEC 61000-4-2
Radiated immunity	1 V/m (80 MHz to 1000 MHz) per IEC 61000-4-3
Fast transient burst	±0.5 kV per IEC61000-4-4
Immunity to conducted disturbances radiated emissions	3 V per IEC61000-4-6
Radiated emissions	40 dB 30 MHz to 230 MHz; 47 dB 230 MHz to 1000 MHz per CISPR 14
Conducted emissions	0.15 MHz to 30 MHz in compliance with CISPR 14

[1] PM2.5 is particulate matter ≤2.5 µm in diameter; PM10 is particulate matter ≤10 µm in diameter.
[2] PM10 in $\mu g/m^3$ is calculated from PM 2.5 readings.
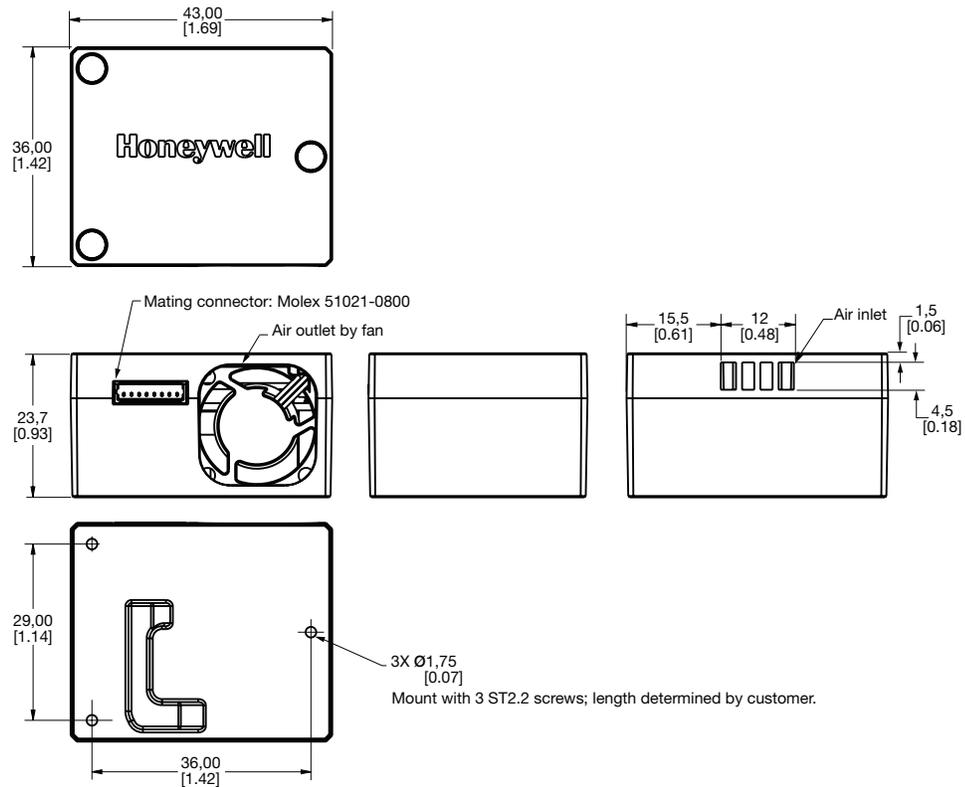[3] Contact Honeywell for other output options.
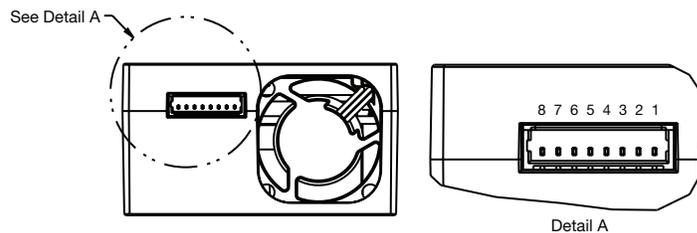
Figure 1. HPM Series Operation
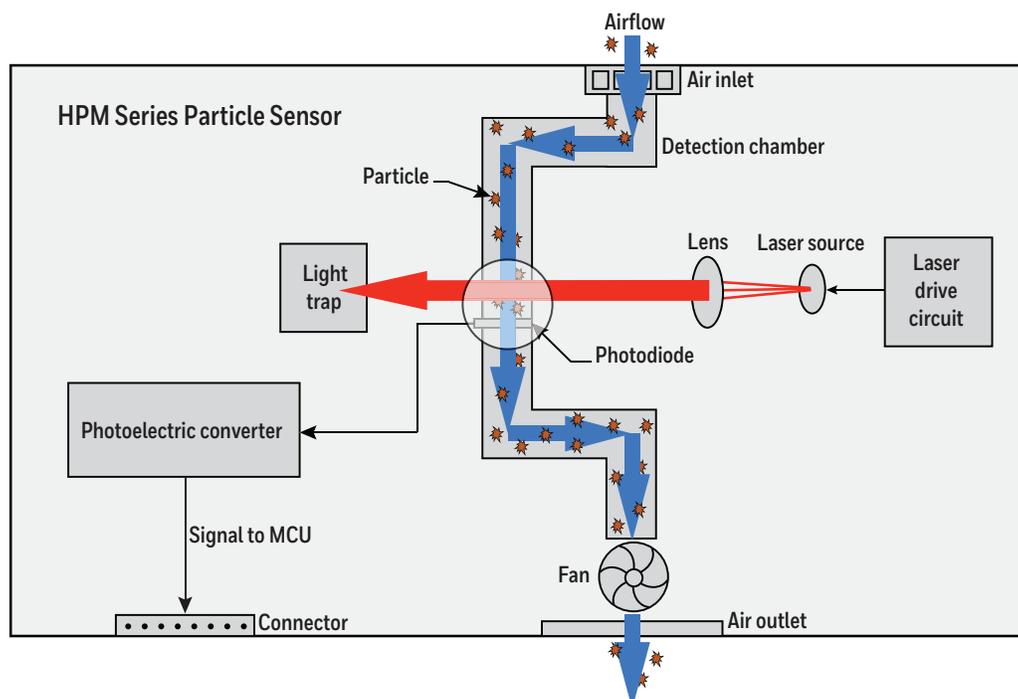
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Figure 2. Mounting Dimensions (mm/[in] For reference only.)

Table 2. Connector Pinout

Detail A

Pin	Name	Description
1	+3.3 V	power output (+3.3 V/100 mA)
2	5 V	power input (5 V)
3	N/A	N/A
4	N/A	N/A
5	TEST	used for testing (NA)
6	TX	UART TX output (0 – 3.3 V)
7	RX	UART RX input (0 – 3.3 V)
8	GND	power input (ground terminal)

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Product Installation

> ## NOTICE
> **IMPROPER INSTALLATION**
>
> To avoid particulate settling or accumulation at the air outlet or air inlet, which may affect product sensitivity and accuracy, ensure the following:
> - The HPM Series Particle Sensor is installed correctly according to Figure 2.
> - The air inlet and air outlets are installed and maintained in a clear air flow.

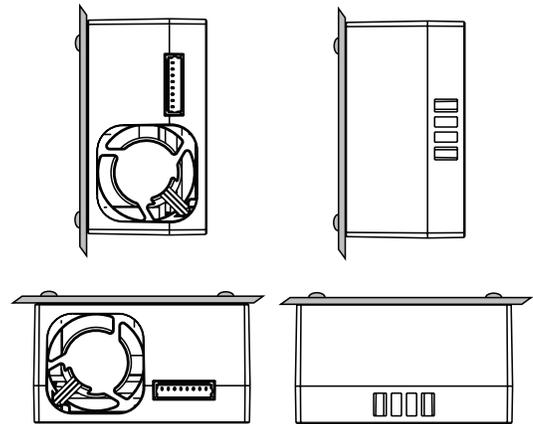Install the product to the desired surface using the screw size shown in Figure 1.

Figure 2. Installation Orientation
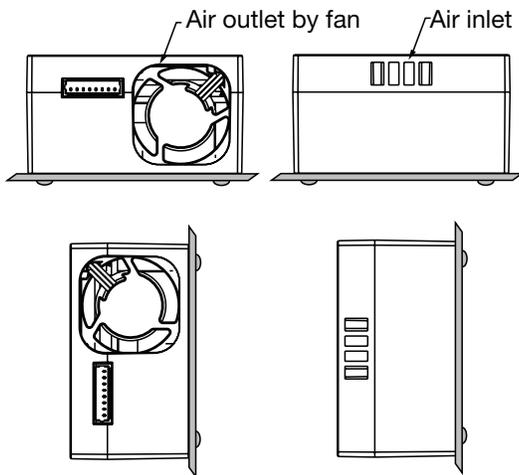
Table 3. Order Guide

Catalog Listing	Description
HPMA115S0-XXX	HPM Series PM2.5 Particle Sensor with UART output

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Table 4. Customer Use Protocol[1]

Command Length (Bytes)	HEAD	LEN	CMD	Data	CS	Example
Read Particle Measuring Results						
Send	0x68	0x01	0x04	NA	CS = MOD ((65536-(HEAD+LEN+CMD+DATA)), 256)	68 01 04 93
Response, Pos ACK	0x40	0x05	0X04	"DF1, DF2, DF3, DF4 PM2.5 = DF1 * 256 + DF2 PM10 = DF3 * 256 + DF4"	CS = MOD ((65536-(HEAD+LEN+CMD+DATA)), 256)	40 05 04 00 30 00 31 56
Response, Neg ACK					0X9696	
Start Particle Measurement						
Send	0x68	0x01	0x01	NA	CS = MOD ((65536-(HEAD+LEN+CMD+DATA)), 256)	68 01 01 96
Response, Pos ACK					0xA5A5	
Response, Neg ACK					0x9696	
Stop Particle Measurement[2]						
Send	0x68	0x01	0x02	NA	CS = MOD ((65536-(HEAD+LEN+CMD+DATA)), 256)	68 01 02 95
Response, Pos ACK					0xA5A5	
Response, Neg ACK					0x9696	
Set Customer Adjustment Coefficient						
Send	0x68	0x02	0x08	DF1: 30 ~ 200 (Default, 100)	CS = MOD ((65536-(HEAD+LEN+CMD+DATA)), 256)	68 02 08 64 2A
Response, Pos ACK					0xA5A5	
Response, Neg ACK					0x9696	
Read Customer Adjustment Coefficient						
Send	0x68	0x01	0x10	NA	CS = MOD ((65536-(HEAD+LEN+CMD+DATA)), 256)	68 01 10 87
Response, Pos ACK	0X40	0X02	0X10	DF1: 30 ~ 200 (Default, 100)	CS = MOD (((65536-(HEAD+LEN+CMD+DATA)), 256)	40 02 10 64 4A
Response, Neg ACK					0x9696	
Stop Auto Send						
Send	0x68	0x01	0x20	NA	CS = MOD ((65536-(HEAD+LEN+CMD+DATA)), 256)	68 01 20 77
Response, Pos ACK					0xA5A5	
Response, Neg ACK					0x9696	
Enable Auto Send[3]						
Send	0x68	0x01	0x40	NA	CS = MOD ((65536-(HEAD+LEN+CMD+DATA)), 256)	68 01 40 57
Response, Pos ACK					0xA5A5	
Response, Neg ACK					0x9696	

[1]Product l life may vary depending on the specific application in which the sensor is utilized.

[2]Shuts down the fan, helping to extend the life of the product.

[3]See Table 5 for data format.

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Table 5. Data Format (Protocol Length: 32 Bytes)

Byte Number	Head0	Head0	Head0
Byte0	Head0	0x42	fixed
Byte1	Head1	0x4d	
Byte2	Len_H	...	Frame Length = 2x13+2(data length + checksum length)
Byte3	Len_L	...	
Byte4	Data0_H	...	reserve
Byte5	Data0_L	...	
Byte6	Data1_H	...	PM2.5 concentration (standard particulate matter)
Byte7	Data1_L	...	
Byte8	Data2_H	...	PM10 concentration (standard particulate matter)
Byte9	Data2_L	...	
Byte10	Data3_H	...	reserve
Byte11	Data3_L	...	
Byte12	Data4_H	...	reserve
Byte13	Data4_L	...	
Byte14	Data5_H	...	reserve
Byte15	Data5_L	...	
Byte16	Data6_H	...	reserve
Byte17	Data6_L	...	
Byte18	Data7_H	...	reserve
Byte19	Data7_L	...	
Byte20	Data8_H	...	reserve
Byte21	Data8_L	...	
Byte22	Data9_H	...	reserve
Byte23	Data9_L	...	
Byte24	Data10_H	...	reserve
Byte25	Data10_L	...	
Byte26	Data11_H	...	reserve
Byte27	Data11_L	...	
Byte28	Data12_H	...	reserve
Byte29	Data12_L	...	
Byte30	CheckSum_H	...	Checksum = Head0+Head1+Len_H+Len_L+Data0_H+...+Data12_L
Byte31	CheckSum_H	...	

ADDITIONAL INFORMATION

The following associated literature is available on the Honeywell web site at sensing.honeywell.com:

• Installation instructions

Find out more

Honeywell serves its customers through a worldwide network of sales offices and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office.

To learn more about Honeywell's sensing and switching products, call **+1–815–235–6847** or **1–800–537–6945,** visit **sensing.honeywell.com,** or e-mail inquiries to **info.sc@honeywell.com**

⚠ **WARNING**
PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

⚠ **WARNING**
MISUSE OF DOCUMENTATION

• The information presented in this datasheet is for reference only. Do not use this document as a product installation guide.
• Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

Warranty/Remedy

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship during the applicable warranty period. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgment or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items that Honeywell, in its sole discretion, finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While Honeywell may provide application assistance personally, through our literature and the Honeywell web site, it is buyer's sole responsibility to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this writing. However, Honeywell assumes no responsibility for its use.

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