

# MEMS flow sensors

**OMRON**

# **MEMS flow sensors you can rely on**

Precise, dependable mass flow measurement in a small package.

We have introduced a new generation of MEMS based flow sensors used for gas flow velocity and mass flow rate measurements. The 3D MEMS structure offers outstanding characteristics in terms of resolution and repeatability even at very low flow rates.

The D6F-V, D6F-W and D6F-P products incorporate a patent pending Dust Segregation System (DSS) allowing it to be used to monitor the performance of fans and air intakes and to detect clogged filters in general. Precision performance is maintained over the product life time with an integral DSS that separates up to 99.5% of dry air borne particulates (simulation result).



# Gas/Air Flow

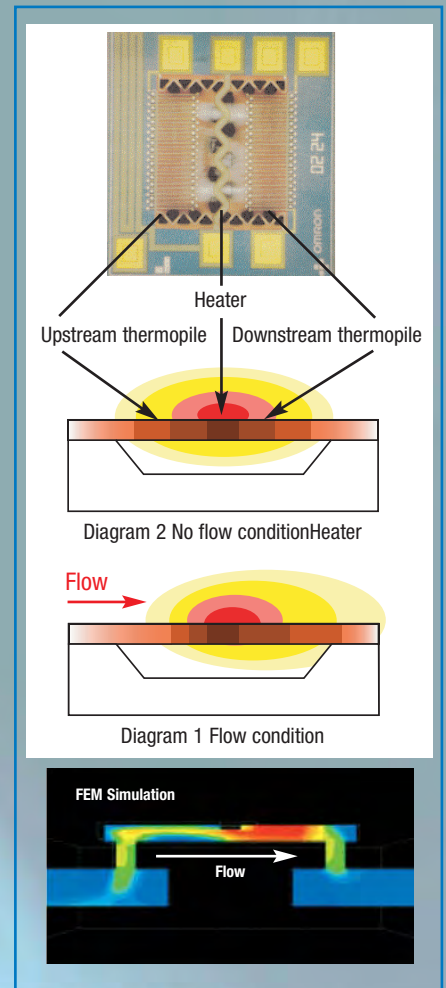
## Flow measurement principle

Inside each D6F there is a highly sensitive MEMS flow chip that is only 1.55mm x 1.55mm x 0.4mm thick. The MEMS flow chip has two thermopiles either side of a tiny heater element used to measure the deviations in heat symmetry caused by the passing gas flow in either direction. A thin layer of insulating film protects the sensor chip from exposure to the gas.

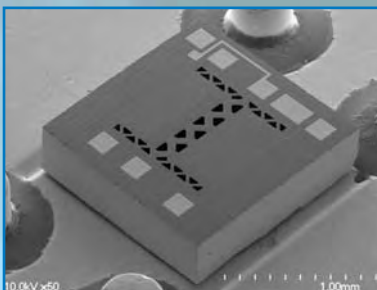
When there is no flow present, temperature distribution concentrated around the heater is uniform and the differential voltage over the two thermopiles is 0V (Diagram 1).

When even the smallest flow is present, temperature on the side of the heater facing the flow cools, and warms up on the other side of the heater - heat symmetry collapses (Diagram 2).

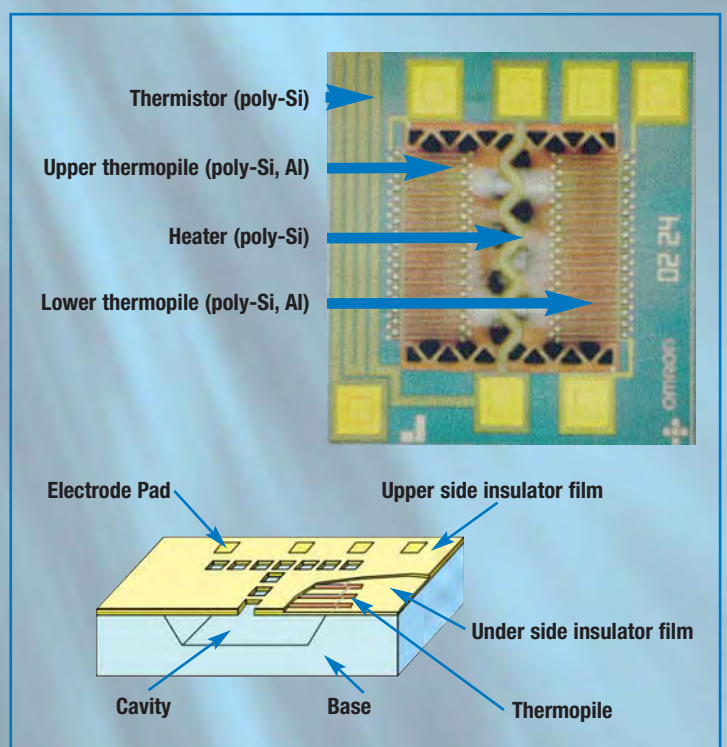
The difference of temperature appears as a differential voltage between the 2 thermopiles - the flow velocity, direction and mass flow rate can be measured.



**Omron has been a leading manufacturer of MEMS based components and modules for measurement and control applications since 1990 and has shipped more than 20 million products.**



We concentrate on bulk micro-machining such as anodic bonding, electro chemical etch (ECE), silicon processes such as thin film deposition, wet and dry etching, electrode formation & fine plastic replication and glass wafer processes.



# Gas and Air Flow Sensors

**Our family of MEMS Flow Sensors includes intelligent compact models capable of measuring flow velocity and mass flow rate movement with highly repeatable accuracy at flow rates from 1LPM to 50LPM (Litre per minute). High sensitivity is achieved with the MEMS Flow Chip.**

Supersensitive gas flow sensors based on proprietary MEMS technology are able to measure gas velocity, direction and mass flow rate for both extremely low and high flow rates. Capable of highly accurate measurements over a wider temperature range compared with conventional mass flow metering, the D6F can detect mass flows with a repeatability of up to +/- 0.1% and an accuracy of up to +/-3% full scale deflection. The extreme sensitivity is achieved with a tiny heating element, associated with temperature sensors on both sides. Custom specific models could be made for quantities of approx. 100k pcs/year.



# Intelli



## Home Appliance

Gas Meter  
Gas Leak Detector  
Building Ventilation  
Boiler/Combustion Control  
Smoke Detector  
Fan Assisted Heater

## Medical

Chest Drainage  
Ventilator  
Anaesthetic device  
CPAP  
Oxygen Concentrator  
Ozone Generator  
Laparoscopic Surgery  
Gas Chromatograph  
Capnograph

## Industrial

Process Control  
Environmental Monitor/Gas Sniffer  
Pressurised Cable Monitoring  
Ventilator control  
Clogged filter detection  
Gas welding machine  
Pick and Place  
Fuel Cell  
Scientific Devices  
Gas flow controller  
Fans

# gent

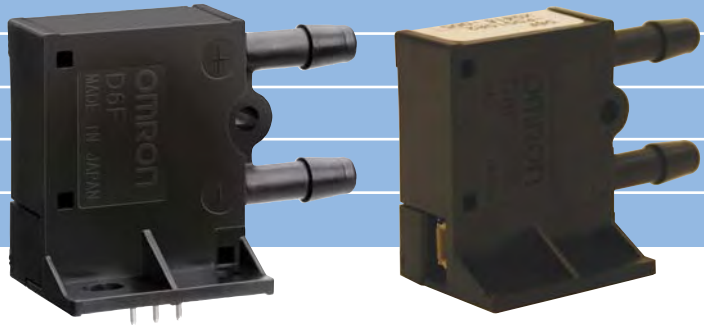
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# Mass Flow Sensors

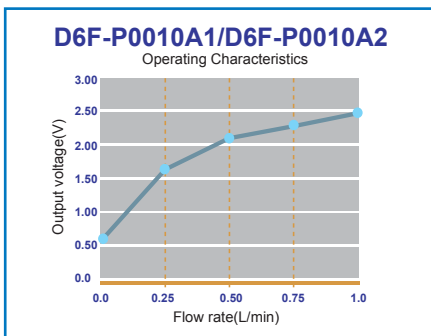
## D6F-P

### Uni-directional mass flow sensor\*

Flow Range	<b>1LPM</b> , PCB terminal type (D6F-P0010A1) <b>1LPM</b> , connector type (D6F-P0010A2)
Compact Size	27.2(L) x 17.2(W) x 35(H)mm
Supply Voltage	4.75 – 5.25VDC
Analogue Output	0.5 to 2.5V
Accuracy	+/- 5% F.S.
Temp Range	-10 to +60°C
Gas Type	Air



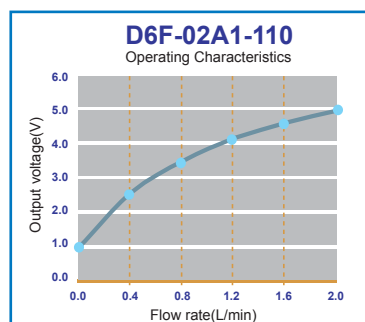
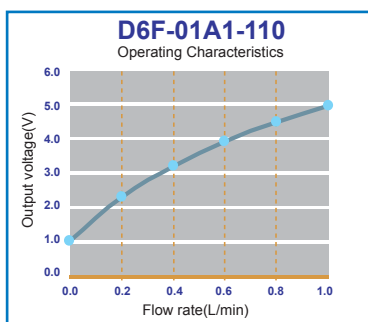
\* Bi-directional mass flow sensor available on request.



## D6F-01A1 / 02A1

### High accuracy mass flow sensor

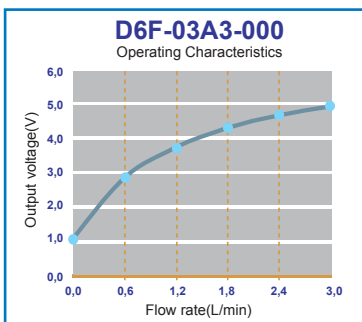
Flow Range	<b>1LPM</b> (D6F-01A1-110) <b>2LPM</b> (D6F-02A1-110)
Compact Size	66(L) x 36(W) x 15.1(H)mm
Supply Voltage	10.8 - 26.4VDC
Analogue Output	1 to 5V
Accuracy	+/- 3% F.S.
Temp Range	-10 to +60°C
Gas Type	Air



## D6F-03A3

### High accuracy mass flow sensor

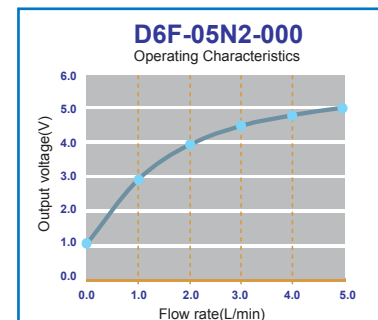
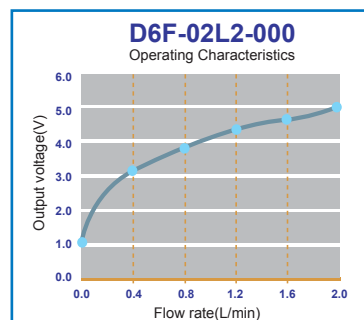
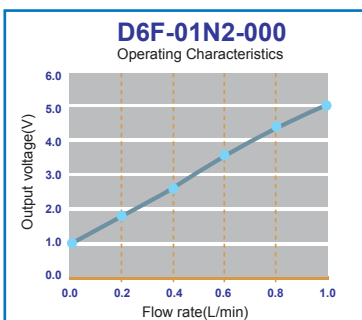
Flow Range	<b>3LPM</b> (D6F-03A3-000)
Ultra-Compact Size	36.6(L) x 8(W) x 16.8(H)mm
Supply Voltage	10.8 - 26.4VDC
Analogue Output	1 to 5V
Accuracy	+/-5% F.S.
Temp Range	0 to 50°C
Gas Type	Air



## D6F-01N2 / 02L2 / 05N2

### High accuracy mass flow sensor

Flow Range	<b>1LPM</b> (D6F-01N2-000), <b>2LPM</b> (D6F-02L2-000), <b>5LPM</b> (D6F-05N2-000)
Compact Size	62 (L) x 21.6(W) x 22.1 (H)mm
Supply Voltage	10.8 - 26.4VDC
Analogue Output	1 to 5V
Accuracy	+/- 3% F.S.
Temp Range	-10 to +60°C
Gas Type	N2 type LNG (Liquified Natural Gas) L2 type LPG (Liquified Propane Gas)



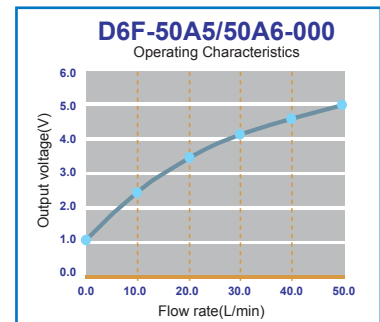
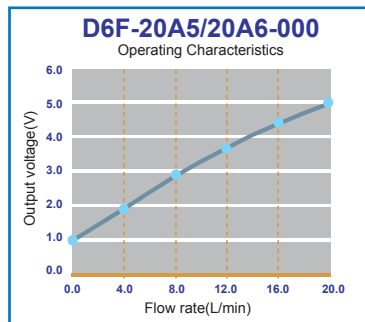
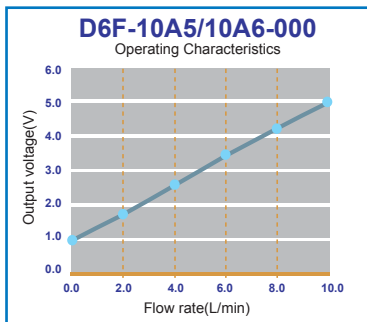
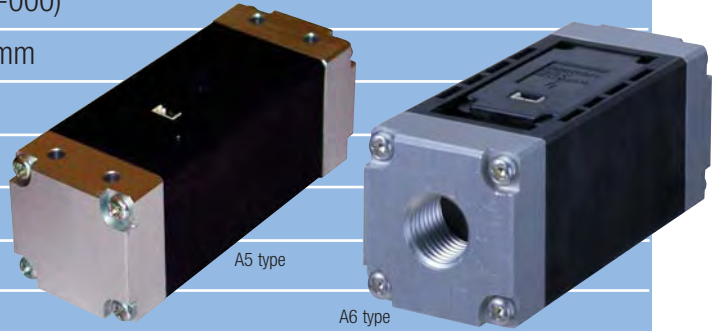


# Mass Flow Sensors

## D6F-10A5 / 20A5 / 50A5-10A6 / 20A6 / 50A6

### High accuracy mass flow sensor

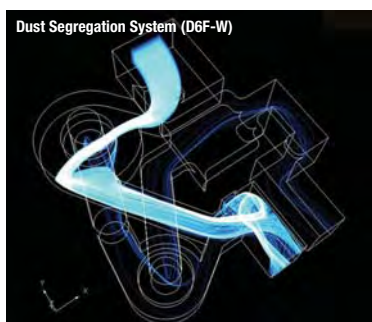
Flow Range	<b>10LPM</b> (D6F-10A5/10A6-000), <b>20LPM</b> (D6F-20A5/20A6-000) <b>50LPM</b> (D6F-50A5/A6-000)
Compact Size	78(L) x 30(W) x 30 (H)mm
Supply Voltage	10.8 - 26.4VDC
Analogue Output	1 to 5V
Accuracy	+/- 3% F.S.
Temp Range	-10 to +60°C
Gas Type	Air



## Air Velocity Sensors

**Our D6F-W and D6F-V Sensors incorporate a Dust Segregation System (DSS) that helps maintain sensing performance in a variety of applications.**

The housing design is based on a centrifugal principle to segregate particulates from the air. Most particulates cannot pass through the sensing area and are discharged through the exhaust route. As a result of the numerical analysis, the efficiency of the Dust Segregation System separates up to 99.5% of dry particulates. The D6F-W01A1 and D6F-W04A1 airflow sensors can measure air velocity from 0-1m/s and 0-4m/s with an accuracy of +/-5% full scale deflection. The D6F-V03A1 measures 0-3m/s. Each is supplied as standard, optimally adjusted at the factory so easy and rapid user application is guaranteed.



# Perf





Cassette (ceiling/suspended) Multimodular Air Conditions  
Duct Connected Heating and Air Conditioning Systems  
Alternative for Single Point Pitot tube  
Air & Water Air Conditioning Systems  
Air Purifiers/ Dehumidifiers  
Fan Assisted Heaters  
Air Cooled, High Power Indoor Lighting  
Mission Critical PC, Workstation Ventilation  
19" Rack Ventilation Systems  
LCD Projectors  
AV Electronics Equipment

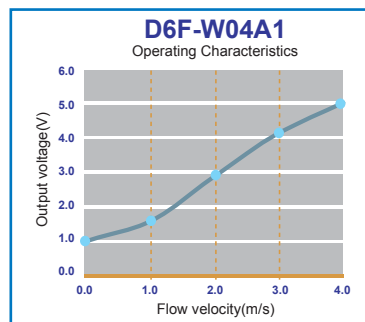
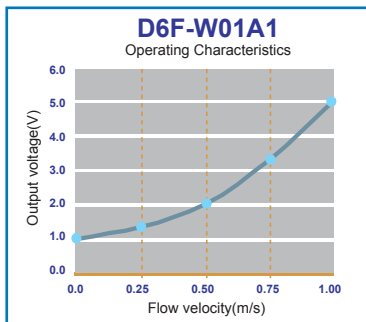
# Performance

# Air Velocity Sensors

## D6F-W01A1 / W04A1

### Precision air flow detection sensor


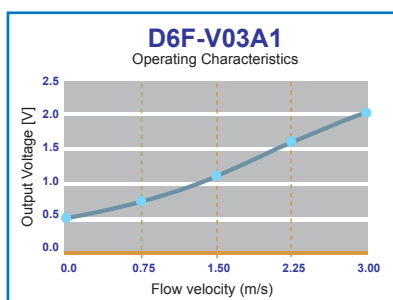
Flow Range	<b>1m/s</b> (D6F-W01A1) <b>4m/s</b> (D6F-W04A1)
Ultra Compact Size	20(L) x 39(W) x 9(H)mm
Supply Voltage	10.8 - 26.4VDC
Analogue Output	1 to 5V
Accuracy	+/- 5% F.S.
Temp Range	-10 to +60°C
Gas Type	Air

A small, blue, rectangular sensor with a white label that reads "OMRON MADE IN JAPAN" and "D6F-W04A1 2115R". It has a circular port on one side and a small protrusion on the other.

## D6F-V03A1

### Precision air flow detection sensor

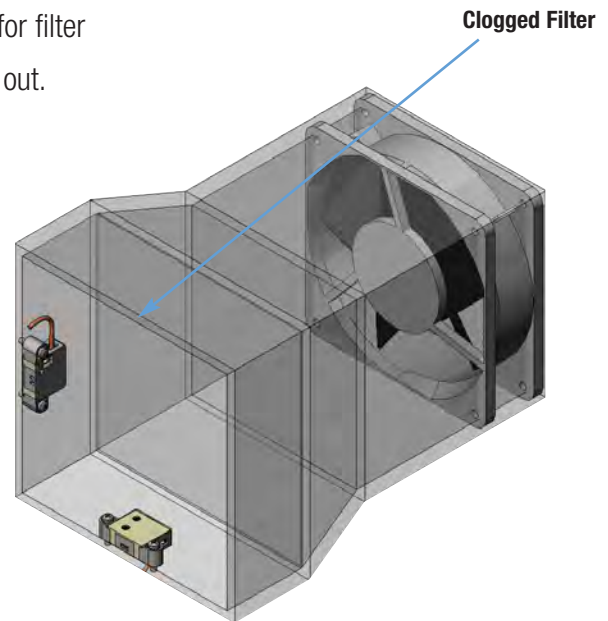
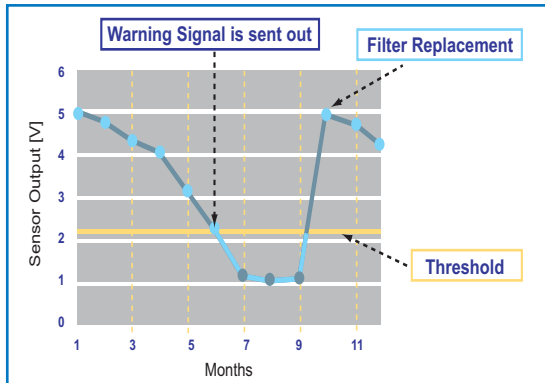
Flow Range	<b>3m/s</b> (D6F-V03A1)
Ultra Compact Size	24(L) x 14(W) x 8(H)mm
Supply Voltage	3.15 - 3.45VDC
Analogue Output	0.5 to 2V
Accuracy	+/- 10% F.S.
Temp Range	-10 to +60°C
Gas Type	Air

A small, black, rectangular sensor with a white label that reads "D6F-V03A1 X0283". It has a circular port on one side and a small protrusion on the other.

## Clogged Filter Detection (Configuration 1)

The sensor detects the pressure drop over the filter. The moment this drop exceeds a given threshold, a warning signal

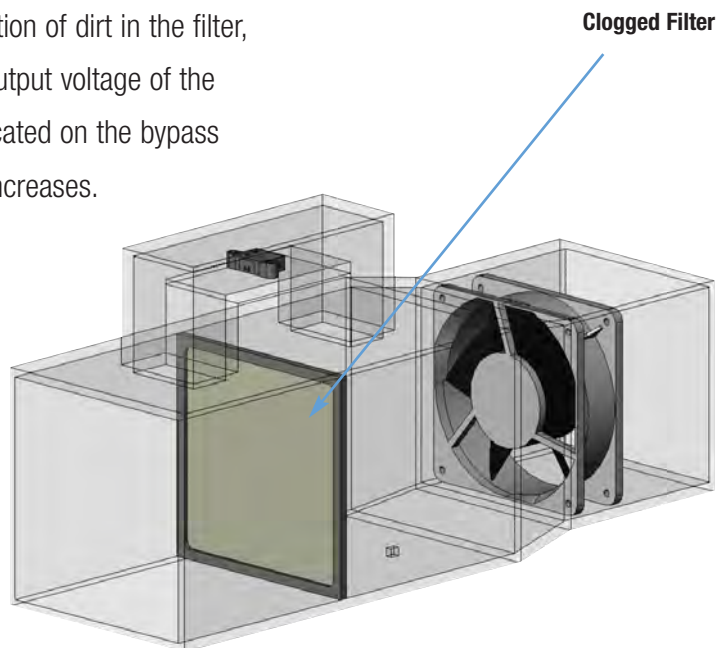
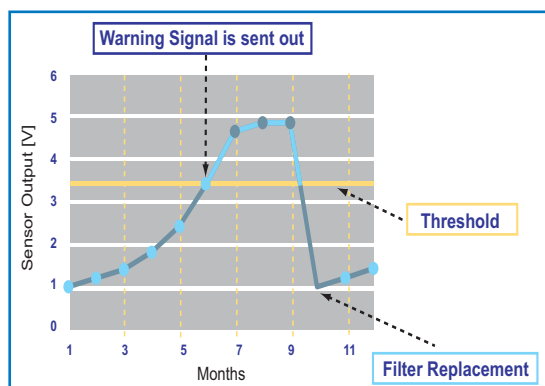
indicating the need for filter replacement is sent out.



## Clogged Filter Detection (Configuration 2)

Filter clogging can be detected, also using the bypass-like configuration. The differential pressure between upstream and downstream of the filter grows in proportion to the

accumulation of dirt in the filter, and the output voltage of the sensor located on the bypass channel increases.



Omron Electronic Components Europe BV reserves the right to make any changes to the specifications of the products described in this brochure at its sole discretion and without prior notice.





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