



iButtonLink
T E C H N O L O G Y

**The MultiSensor™
User Guide**

Sensors for the 1-Wire® Bus

Table of Contents

List of Tables	4
List of Figures	4
Introduction	5
Copyright Notices	5
Contact Information	5
Common Features	6
<i>Power</i>	6
<i>Casing</i>	6
<i>Connectors</i>	6
<i>Temperature Considerations and ADC</i>	6
<i>Additional Sensors</i>	7
<i>Barcodes</i>	7
<i>Type Codes</i>	7
MS-T: Temperature Sensor	8
MS-TH: Temperature and Humidity Sensor	9
MS-TV: Temperature and Voltage Sensor	10
MS-TL: Temperature and Light Sensor	11
MS-TC: Temperature and Current Sensor	12
MS-TPS: Temperature and Static Air Pressure Sensor	13
MS-TPD: Temperature and Differential Air Pressure Sensor	14
APPENDIX A: Pin Assignments	15
APPENDIX B: MS Type Codes	16
<i>How to Read 1-Wire® Viewer</i>	16
APPENDIX C: Honeywell Humidity Sensor Spec Sheet	19
APPENDIX D: PDV-P8101 Spec Sheet	25
APPENDIX E: CR Magnetics CR3100 Series Split-Core	26
APPENDIX F: Omron D6F-P0010A Spec Sheet	27
APPENDIX G: Power	31
APPENDIX H: MS-TH VOLTAGE AND ACCURACY	32
Index	33
Glossary of Terms	34
Revision History	35

List of Tables

Table 1: The wire color and connections for the EIA/TIA 568 RJ-45 cable.....	15
Table 2: A table showing the type code for each of the MultiSensor™ variations	16
Table 3: A table to help users calculate the output voltage based on a given RH% and a Vsupply value, as well as the RH% based on a received voltage and a Vsupply value.....	32

List of Figures

Figure 1- Standard EIA/TIA 568 RJ-45 Colors.....	15
Figure 2: Under “Contents,” highlighted by a red box, "1D" is being displayed in the first available space, highlighted by a blue box. This indicates that a MS-TW has been connected...	17
Figure 3: The MS-TH's four-digit type code being displayed in the first two available places. The first two digits, "19," are in the first spot and the second two digits, "01," are in the second.	18

Introduction

The MultiSensor™ family provides a reliable solution for the need to monitor, measure, record, and alarm remote parameters.

Currently, there are seven (7) variations of the MultiSensor™:

Temperature only	Temperature and humidity
Temperature and voltage	Temperature and light
Temperature and differential air pressure (with attached diverter)	Temperature and air pressure
Temperature and current	

Copyright Notices

© iButtonLink 2016. All rights are reserved. This document may not, in any form, be reproduced or transmitted without the prior consent from iButtonLink.

iButton® and 1-Wire® are registered trademarks of Maxim Integrated, San Jose, CA USA

The LINK™ and LinkLocator™ are trademarks of iButtonLink, Whitewater, WI USA

FxB™ is a licensed trademark of Alicit Engineering, San Antonio, TX USA
Alicit currently has a patent pending on the FxB™ protocol.

Contact Information

iButtonLink
1221 Innovation Drive STE 117
Whitewater, WI 53190

Phone: (262) 662-4029
Fax: (262) 436-2403
Email: info@iButtonLink.com
Website URL: www.iButtonLink.com

Common Features

The MultiSensor™ family operates on the 1-Wire® bus structure. Therefore, many MultiSensors™ have some identical functions.

Typically, 10 – 15 devices can be supported on a 1-Wire® network without additional external power. A bus master with external power capabilities, such as the LinkHub, will provide additional power if needed when additional external power is required.

Power

Some MultiSensors™ can operate on “parasitic power,” meaning that they use power from the data signal of the 1-Wire® bus in order to operate.

NOTE: From more information on power, please see [Appendix G](#).

Casing

All MultiSensors™ are contained in a plastic box with flanges for convenient mounting. These enclosures are not weatherproof. They are intended for indoor use and to protect the electronics from coming in contact with external items that may cause damage or failure.

The casing has a cutout in the side to allow for airflow to the sensing device to allow the MultiSensors™ to measure temperature, and a screen over the opening keeps foreign materials out.

Connectors

A RJ-45 connector on either end of the unit allows for a simple connection of the sensor to +5 volts and grounds on the 1-Wire® bus using cat 5E cables and a connection to the next device on the bus. The 1-Wire® slaves are parallel to one another, and the order they are linked does not require a particular order.

The RJ-45 jacks will accept RJ-12 plugs as well. Pin assignments for the RJ-45 connectors are shown in [Appendix A](#).

NOTE: These devices are not Ethernet compatible.

Temperature Considerations and ADC

The ADC used in all MultiSensors™ is a DS2438Z. Detailed information on this product can be found on the Maxim Integrated website. Because the sensing device is partially enclosed and mounted to the PCB, the response time to temperature changes will be relatively slow. The sensor should not be placed in direct sunlight, as the radiant heat will become trapped inside the enclosure and cause readings higher than ambient.

Additional Sensors

Specification sheets for the additional sensors found in some MS products can be found in Appendixes C – G in the back of this manual.

Barcodes

Each MultiSensor™ has at least one barcode sticker with a serial number on it ending in a “T”. Some MultiSensors™ will have a second barcode sticker on it with an additional serial number ending in a different letter depending on the type of sensor. For example, the MS-TV will have one sticker with a serial number ending in “T” and another number ending with “V” on a second sticker.

These barcodes can be scanned in order to speed up the installation process. The barcode ending in “T” will give information on the temperature sensor; the barcode ending in another letter will give information about any additional sensor used.

Type Codes

Type Codes and instructions on how to read the codes on 1-Wire® Viewer can be found in [Appendix B](#) of this manual.

MS-T: Temperature Sensor

The MS-T measures temperature only.

TEMPERATURE RANGE: -40°C to +85°C

ACCURACY: $\pm 2^{\circ}\text{C}$



MS-TH: Temperature and Humidity Sensor

The MS-TH measures relative humidity as well as temperature.

TEMPERATURE RANGE: -40°C to +85°C

HUMIDITY RANGE: 0% to 100% relative humidity

ACCURACY: ±2°C

ACCURACY: ±3.5% relative humidity

RESPONSE TIME: 30 seconds in slow-moving air

ADDITIONAL SENSOR (CURRENT): Honeywell
HIH-4000

ADDITIONAL SENSOR (ORIGINAL): Honeywell HIH3600



NOTES:

- Due to the presence a protection diode, the **MS-TH uses a voltage of 4.7V instead of 5.0V**. More information on this can be found in [Appendix H](#).
- The Vcc must be sustained over 4 VDC with 5 VDC being optimal. Please see [Appendix C](#) for more information.
- When using with a Link45 or Link12, humidity will be reported in the range of .8 VDC (0% humidity) and 4.07 VDC (100% humidity)
- When using with a LinkTH, the readings will be converted to % humidity
- The correct equation for calculating humidity from the raw sensor voltage is:
 $V_{OUT} = (4.7)(0.0062(\text{sensor RH}) + 0.16)$. More information can be found in [Appendix H](#).

MS-TV: Temperature and Voltage Sensor

The MS-TV measures DC voltage as well as temperature.

TEMPERATURE RANGE: -40°C to +85°C

VOLTAGE RANGE: 0 to +10 volts



NOTES:

- Voltage is measured by two 30 inch 18-gauge wires
- Voltage can be sourced from any other sensor that produces a DC voltage signal in the range of 0 to +10 VDC
- The device being measured does not need to be 1-Wire® compatible

MS-TL: Temperature and Light Sensor

The MS-TL measures light presence as well as temperature.

TEMPERATURE RANGE: -40°C to +85°C

VOLTAGE RANGE: 0 to +5 volts

ADDITIONAL SENSOR: PDV-P8101

READOUT: “True” indicates light present. “False” indicates no light present.



NOTES:

- The maximum 5 volts is the same intensity as a 100 watt lightbulb at a distance of 6 inches. The minimum 0 volts is the same as total darkness
- There is a hole in the top of the enclosure directly over the light sensor that should be kept clear and face the light source to be monitored

MS-TC: Temperature and Current Sensor

The MS-TC measures current as well as temperature.

TEMPERATURE RANGE: -40°C to +85°C

CURRENT RANGE: 0 to +20 amps

ACCURACY: ±3% (not calibrated)

ADDITIONAL SENSOR: CR Magnetics
CR3100 Series Split-Core current
transformer



NOTES:

- The sensing device is a clamp-on current transformer
- Shipped with 3 feet of 18-gauge wire extending from casing
- Readings below 1 amp and above 20 amps will not be specified
- When used with a Link45 or Link12, the output reading will be .09 VDC to 3.78 VDC
- When used with a LinkTH, the output will be a three-digit number from 1.00 to 20.0

MS-TPS: Temperature and Static Air Pressure Sensor

The MS-TPS measures static air pressure as well as temperature.

TEMPERATURE RANGE: 0°C to +80°C

FLOW RANGE: 0 – 1 LPM

REQUIRED VOLTAGE: 12 volts (see notes)

ADDITIONAL SENSOR: Omron D6F-P0010A



NOTES:

- The differential pressure for the location is read
- The device needs 12VDC supplied on pins 7 and 8 of the RJ-45 to operate

MS-TPD: Temperature and Differential Air Pressure Sensor

The MS-TPD measures differential air pressure as well as temperature.

TEMPERATURE RANGE: 0°C to +80°C

FLOW RANGE: 0 – 1 LPM

REQUIRED VOLTAGE: 12 volts (see notes)

ADDITIONAL SENSOR: Omron D6F-P0010A



NOTES:

- The inputs are redirected by the use of a diverter element, affecting a 180 degree separation of the two inputs
- The inputs can be extended with flex tubing, allowing for measurements of differential pressure for air handling units, air conditioning systems, and so on
- The device needs 12VDC supplied on pins 7 and 8 of the RJ-45 to operate

APPENDIX A: Pin Assignments

The pin assignments listed below are viewed as looking into either jack on any MS product.

The latch is on the bottom side of the jack.

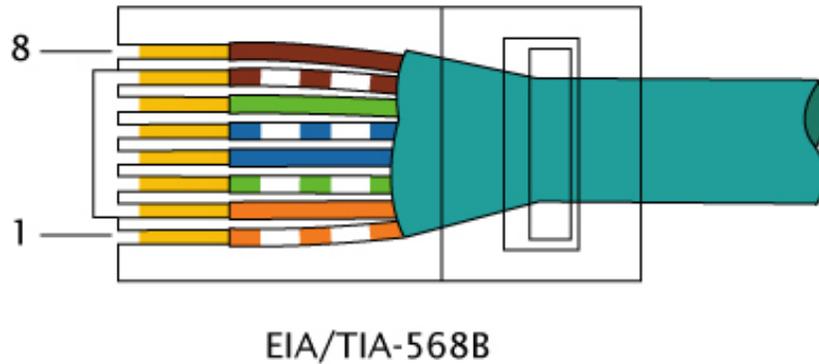


Figure 1: Standard EIA/TIA 568 RJ-45 Colors

Used with thanks to Lp for public domain image: https://commons.wikimedia.org/wiki/File:RJ-45_TIA-568A_Left.png

Pin	EIA/TIA 563A Cable Color	1-Wire® Connection	Notes
1	Orange and White	5 volt return	
2	Orange	+5 volts	
3	Green and White	Aux return	
4	Blue	1-Wire® Data	
5	White and Blue	1-Wire® Return	
6	Green	AUX (Switched +5 volts)	
7	White and Brown	V+ (+12 volts)	
8	Brown	+12 volts returns	Ground

Table 1: The wire color and connections for the EIA/TIA 568 RJ-45 cable.

APPENDIX B: MS Type Codes

In order to identify every MS product by type, two bytes (00 and 01) are programmed into the product. The first byte determines the product type; the second byte can contain a variant. These bytes can be seen using the 1-Wire® Viewer.

Bytes 0 (and possibly 1) contain a code from the table below.

MultiSensor™ type codes – DS2438 User memory byte 0 (&1)		
Type	Hex value	Notes
MS-T	00	
MS-TH	19	original HIH3600 humidity sensor
MS-TH	1901	current HIH4000 humidity sensor
MS-TV	1A	
MS-TL	1B	
MS-TC	1C	
MS-TW	1D	
MS-THW	1E	
MS-TPS	1F	
MS-TPD	20	
MS-TPM	21	

Table 2: A table showing the type code for each of the MultiSensor™ variations

How to Read 1-Wire® Viewer

NOTE:

Additional information on using 1-Wire® Viewer can be found [here](#).

- Each device found on the adaptor will be listed under “Device List.” These devices will be listed by serial number, followed by the product number of any internal sensors found.
- Select the desired sensor from the list.
- Depending on the sensor, a number of tabs will appear along the top of the right-hand side of the screen. Select the “Memory” tab.
- A field labeled “Banks” will appear beneath the top tabs. Select “User Main Memory” from the list provided.
- Under the box labeled “Contents,” the MultiSensor’s™ type code will appear in the first available space, as seen in Figure Two below.

FIGURE TWO

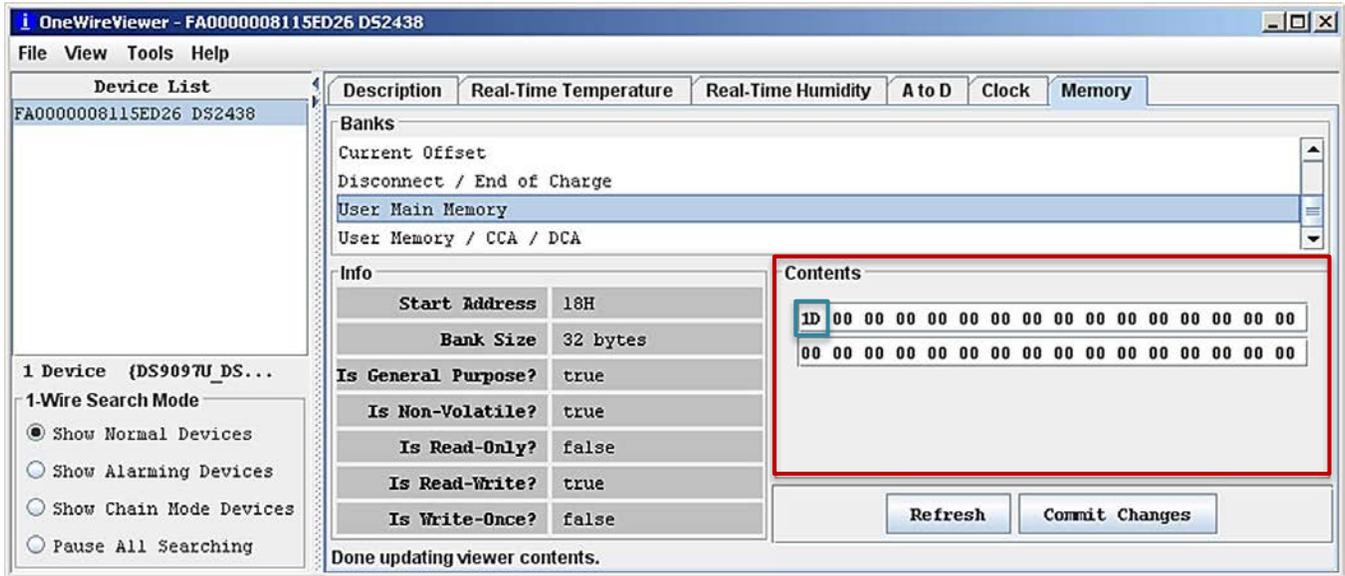


Figure 2: Under “Contents,” highlighted by a red box, "1D" is being displayed in the first available space, highlighted by a blue box. This indicates that a MS-TW has been connected.

NOTE: For the MS-TH using the current humidity sensor, the type code will be displayed in the first two available spaces, as shown in Figure Three below.

FIGURE THREE

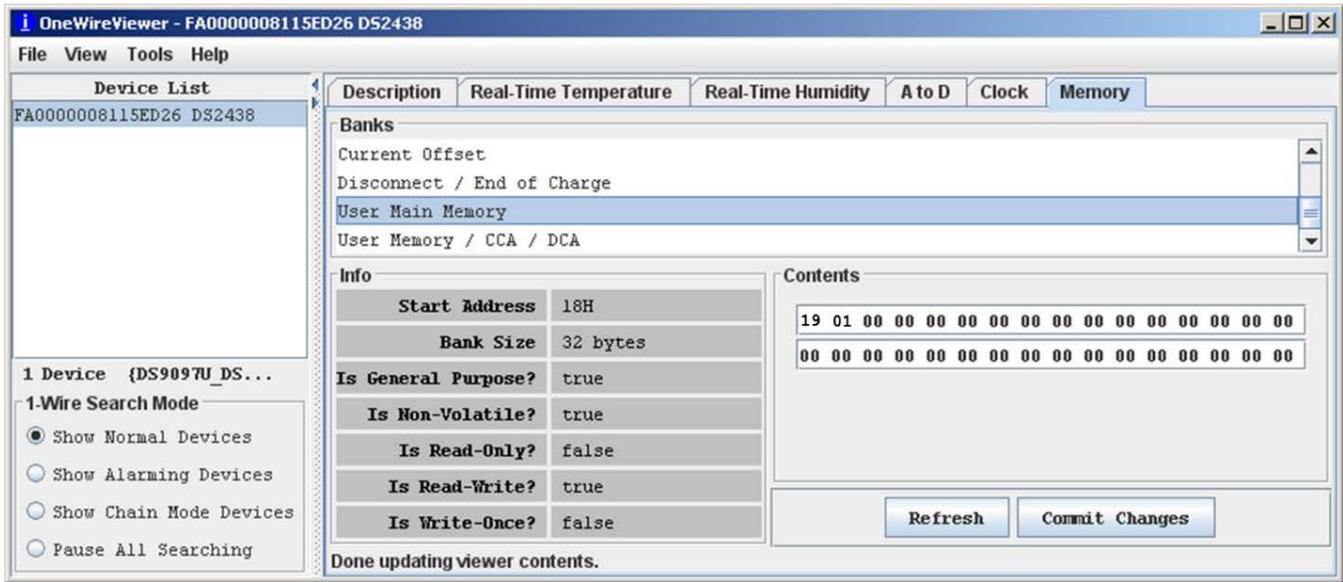
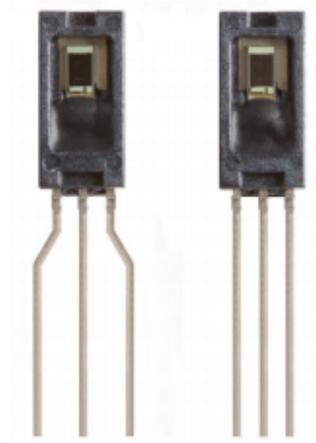


Figure 3: The MS-TH's four-digit type code being displayed in the first two available places. The first two digits, "19," are in the first spot and the second two digits, "01," are in the second.

APPENDIX C: Honeywell Humidity Sensor Spec Sheet

Honeywell

HIH-4000 Series Humidity Sensors



DESCRIPTION

The HIH-4000 Series Humidity Sensors are designed specifically for high volume OEM (Original Equipment Manufacturer) users.

Direct input to a controller or other device is made possible by this sensor's near linear voltage output. With a typical current draw of only 200 μ A, the HIH-4000 Series is often ideally suited for low drain, battery operated systems.

Tight sensor interchangeability reduces or eliminates OEM production calibration costs. Individual sensor calibration data is available.

FEATURES

- Molded thermoset plastic housing
- Near linear voltage output vs % RH
- Laser trimmed interchangeability
- Low power design
- Enhanced accuracy
- Fast response time
- Stable, low drift performance
- Chemically resistant

The HIH-4000 Series delivers instrumentation-quality RH (Relative Humidity) sensing performance in a competitively priced, solderable SIP (Single In-line Package).

Available in two lead spacing configurations, the RH sensor is a laser trimmed, thermoset polymer capacitive sensing element with on-chip integrated signal conditioning.

The sensing element's multilayer construction provides excellent resistance to most application hazards such as wetting, dust, dirt, oils and common environmental chemicals.

POTENTIAL APPLICATIONS

- Refrigeration equipment
- HVAC (Heating, Ventilation and Air Conditioning) equipment
- Medical equipment
- Drying
- Metrology
- Battery-powered systems
- OEM assemblies

HIH-4000 Series

Table 1. Performance Specifications (At 5 Vdc supply and 25 °C [77 °F] unless otherwise noted.)

Parameter	Minimum	Typical	Maximum	Unit	Specific Note
Interchangeability (first order curve)	–	–	–	–	–
0% RH to 59% RH	-5	–	5	% RH	–
60% RH to 100% RH	-8	–	8	% RH	–
Accuracy (best fit straight line)	-3.5	–	+3.5	% RH	1
Hysteresis	–	3	–	% RH	–
Repeatability	–	±0.5	–	% RH	–
Settling time	–	–	70	ms	–
Response time (1/e in slow moving air)	–	5	–	s	–
Stability (at 50% RH)	–	1.2	–	% RH	–
Voltage supply	4	–	5.8	Vdc	2
Current supply	–	200	500	µA	–
Voltage output (1 st order curve fit)	$V_{OUT} = (V_{SUPPLY})(0.0062(\text{sensor RH}) + 0.16)$, typical at 25 °C				
Temperature compensation	True RH = (Sensor RH)/(1.0546 – 0.00216T), T in °C				
Output voltage temperature, coefficient at 50% RH, 5 V	–	-4	–	mV/°C	–
Operating temperature	-40[-40]	See Figure 1.	85[185]	°C[°F]	–
Operating humidity	0	See Figure 1.	100	% RH	3
Storage temperature	-50[-58]	–	125[257]	°C[°F]	–
Storage humidity	See Figure 2.			% RH	3

Specific Notes:

- Can only be achieved with the supplied slope and offset.
For HIH-4000-003 and HIH-4000-004 catalog listings only.
- Device is calibrated at 5 Vdc and 25 °C.
- Non-condensing environment.

General Notes:

- Sensor is ratiometric to supply voltage.
- Extended exposure to ≥90% RH causes a reversible shift of 3% RH.
- Sensor is light sensitive. For best performance, shield sensor from bright light.

FACTORY CALIBRATION DATA

HIH-4000 Sensors may be ordered with a calibration and data printout. See Table 2 and the order guide on the back page.

Table 2. Example Data Printout

Model	HIH-4000-003
Channel	92
Wafer	030996M
MRP	337313
Calculated values at 5 V	
V _{OUT} at 0% RH	0.826 V
V _{OUT} at 75.3% RH	3.198 V
Linear output for 3.5% RH accuracy at 25 °C	
Zero offset	0.826 V
Slope	31.483 mV/%RH
RH	$(V_{OUT} - \text{zero offset})/\text{slope}$ $(V_{OUT} - 0.826)/0.0315$
Ratiometric response for 0% RH to 100% RH	
V _{OUT}	V _{SUPPLY} (0.1652 to 0.7952)



Humidity Sensors

Figure 1. Operating Environment (Non-condensing environment.)

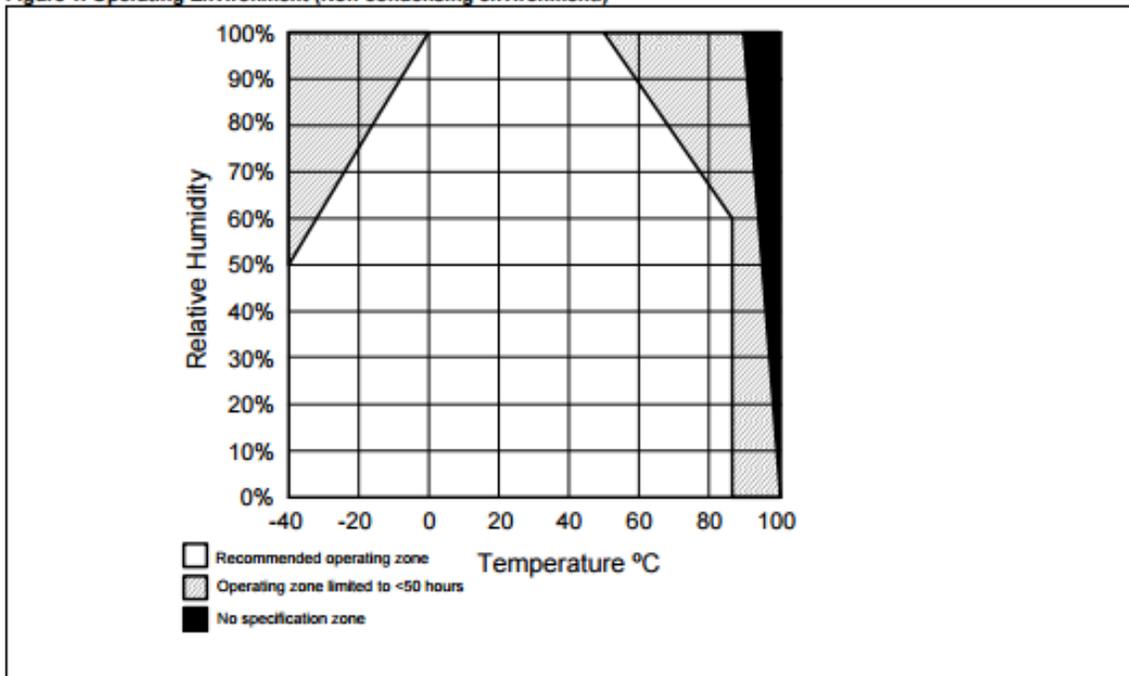


Figure 2. Storage Environment (Non-condensing environment.)

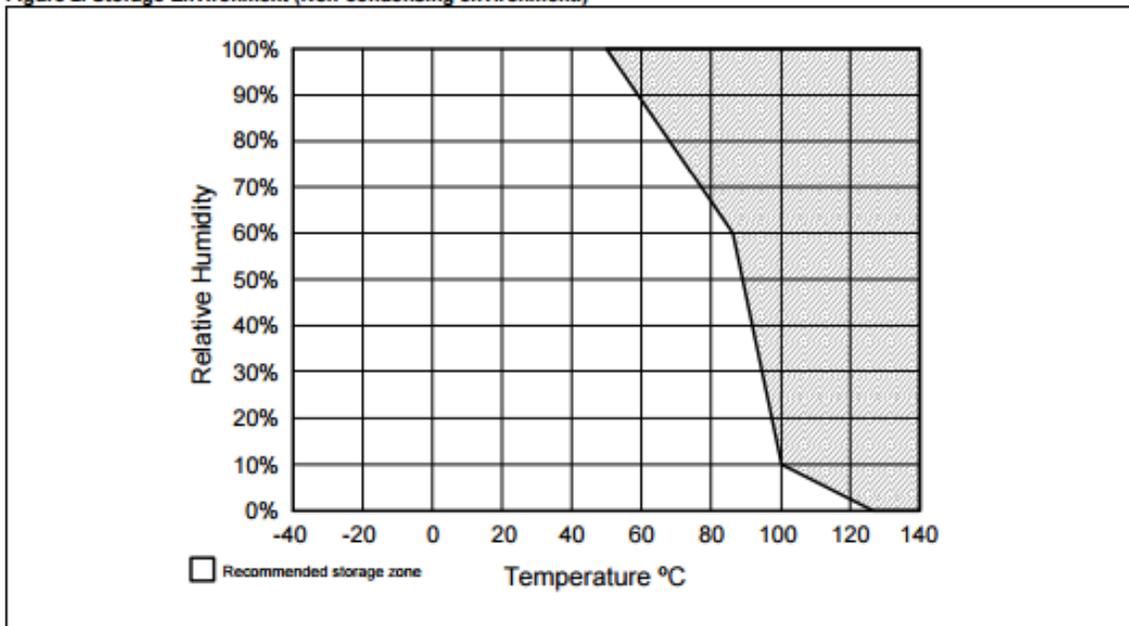


Figure 3. Typical Output Voltage vs Relative Humidity (At 25 °C and 5 V.)

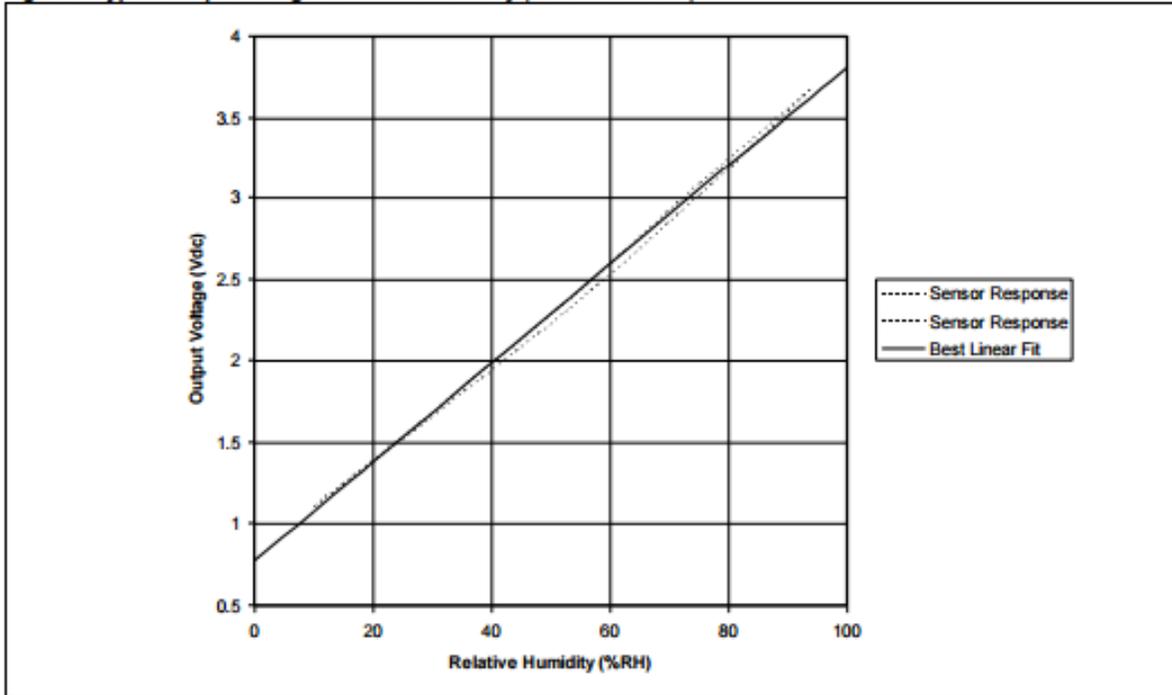
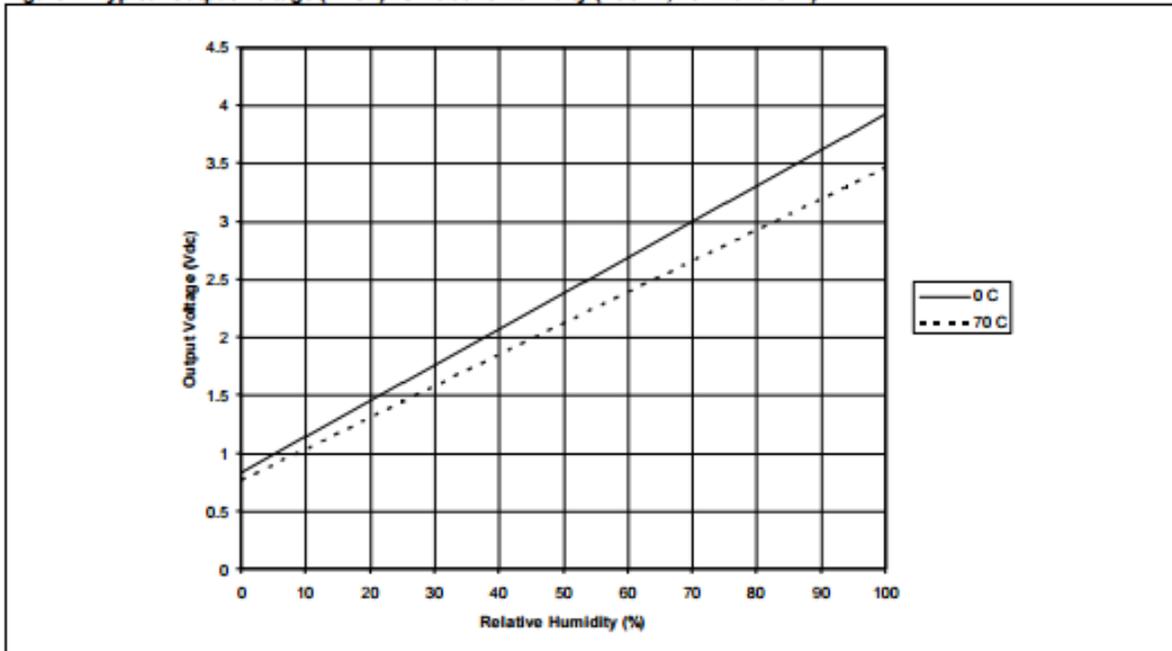


Figure 4. Typical Output Voltage (BFSL) vs Relative Humidity (At 0 °C, 70 °C and 5 V.)



Humidity Sensors

Figure 5. Mounting Dimensions (For reference only. mm/[in])

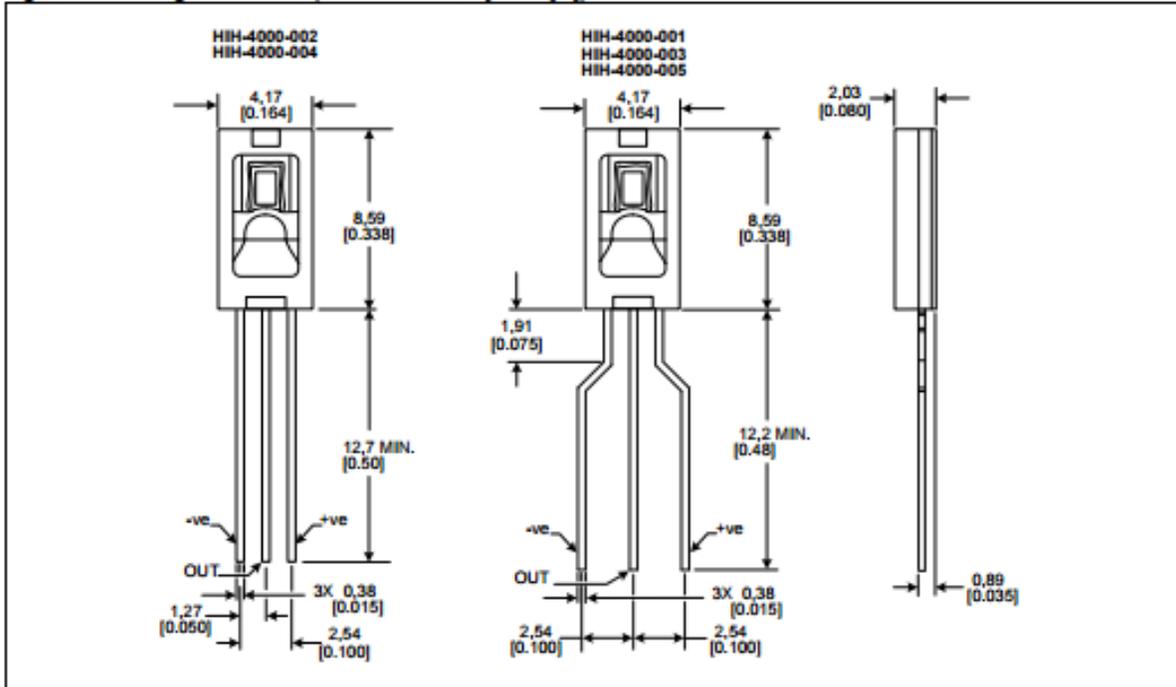
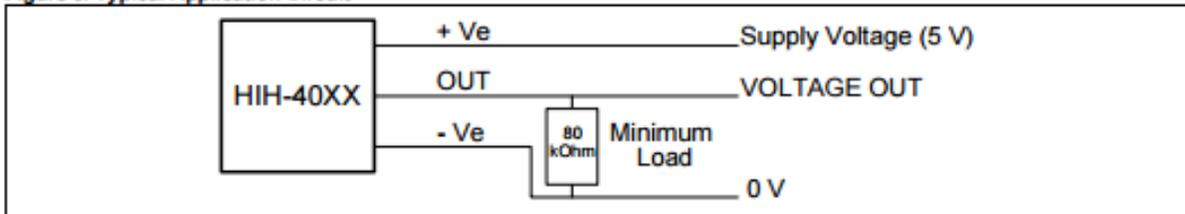


Figure 6. Typical Application Circuit



ORDER GUIDE

Catalog Listing	Description
HIH-4000-001	Integrated circuit humidity sensor, 2,54 mm [0.100 in] lead pitch SIP
HIH-4000-002	Integrated circuit humidity sensor, 1,27 mm [0.050 in] lead pitch SIP
HIH-4000-003	Integrated circuit humidity sensor, 2,54 mm [0.100 in] lead pitch SIP, calibration and data printout
HIH-4000-004	Integrated circuit humidity sensor, 1,27 mm [0.050 in] lead pitch SIP, calibration and data printout
HIH-4000-005	Equivalent to HIH-4000-001

ADDITIONAL HUMIDITY SENSOR INFORMATION

See the following associated literature at www.honeywell.com/sensing:

- Product installation instructions
- Application sheets:
 - Humidity Sensor Performance Characteristics
 - Humidity Sensor Theory and Behavior
 - Humidity Sensor Moisture and Psychrometrics
 - Thermoset Polymer-based Capacitive Sensors

▲ WARNING

MISUSE OF DOCUMENTATION

- The information presented in this product sheet 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. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement 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 it 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 we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer 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 printing. However, we assume no responsibility for its use.

▲ 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.

SALES AND SERVICE

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

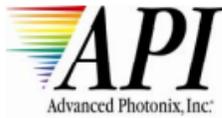
E-mail: info.sc@honeywell.com

Internet: www.honeywell.com/sensing

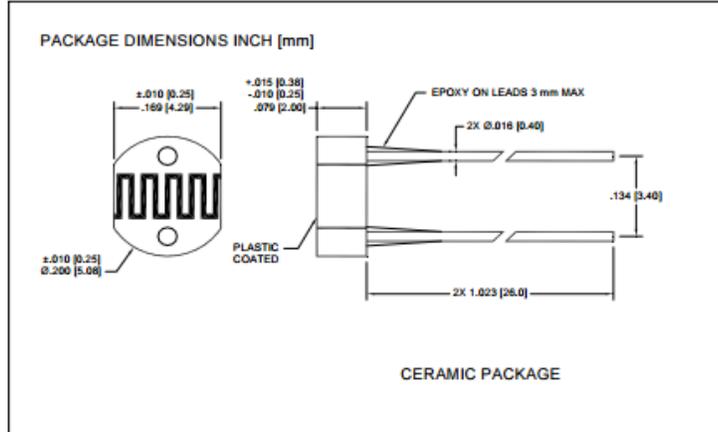
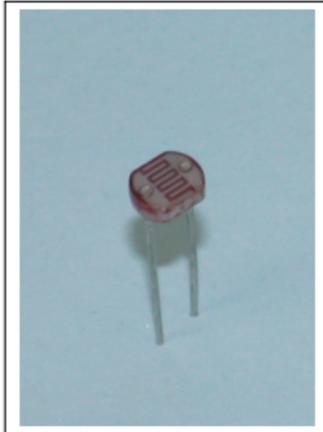
Phone and Fax:

Asia Pacific	+65 6355-2828 +65 6445-3033 Fax
Europe	+44 (0) 1698 481481 +44 (0) 1698 481676 Fax
Latin America	+1-305-805-8188 +1-305-883-8257 Fax
USA/Canada	+1-800-537-6945 +1-815-235-6847 +1-815-235-6545 Fax

APPENDIX D: PDV-P8101 Spec Sheet



CdS Photoconductive Photocells PDV-P8101



FEATURES

- Visible light response
- Sintered construction
- Low cost

DESCRIPTION

The **PDV-P8101** are (CdS), Photoconductive photocells designed to sense light from 400 to 700 nm. These light dependent resistors are available in a wide range of resistance values. They're packaged in a two leaded plastic-coated ceramic header.

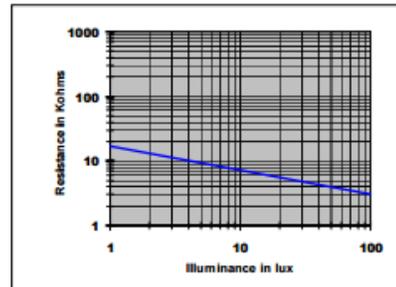
APPLICATIONS

- Camera exposure
- Shutter controls
- Night light Controls

ABSOLUTE MAXIMUM RATING (TA)≅ 23°C UNLESS OTHERWISE NOTED

SYMBOL	PARAMETER	MIN	MAX	UNITS
V _{pk}	Applied Voltage		150	V
P _{cl Δpo/Δt}	Continuous Power Dissipation		100	mW/°C
T _O	Operating and Storage Temperature	-30	+75	°C
T _S	Soldering Temperature*		+260	°C

* 0.200 inch from base for 3 seconds with heat sink.



ELECTRO-OPTICAL CHARACTERISTICS RATING (TA)≅ 23°C UNLESS OTHERWISE NOTED

SYMBOL	CHARACTERISTIC	TEST CONDITIONS	MIN	TYP	MAX	UNITS
R _D	Dark Resistance	After 10 sec. @ 10 Lux @ 2856 °K	0.15			MΩ
R _I	Illuminated Resistance	10 Lux @ 2856 °K	4		11	KΩ
S	Sensitivity	$\frac{\text{LOG}(R_{100})-\text{LOG}(R_{10})^{**}}{\text{LOG}(E_{100})-\text{LOG}(E_{10})^{***}}$		0.65		Ω/Lux
λ _{range}	Spectral Application Range	Flooded	400		700	nm
λ _{peak}	Spectral Application Range	Flooded		520		nm
t _r	Rise Time	10 Lux @ 2856 °K		55		ms
T _f	Fall Time	After 10 Lux @ 2856 °K		20		ms

**R100, R10: cell resistances at 100 Lux and 10 Lux at 2856 °K respectively .

***E100, E10: luminances at 100 Lux and 10 Lux 2856 °K respectively.

Information in this technical datasheet is believed to be correct and reliable. However, no responsibility is assumed for possible inaccuracies or omission. Specifications are subject to change without notice.

REV 3/30/06

APPENDIX E: CR Magnetics CR3100 Series Split-Core Current Transformer Spec Sheet

Current Transformers

F

Split Core Current Transformer

CR3100 Series



The **CR3100** Series Split Core Current Transformer is designed to provide a low cost method to monitoring electrical current. A unique hinge and locking snap allows attachment without interrupting the current-carrying wire. High secondary turn will develop signals up to 10.0 VAC across a burden resistor.

Applications

Portable Instruments
Sub-Metering
Monitor Motor Loads

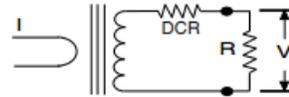
Features

Small Size
Low Cost
High Secondary Turns
Secure Locking Hinge

Specifications

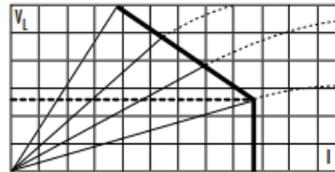
Maximum Continuous Primary Current 4 X I_r
Insulation Voltage 3500 Vac/1min
Storage Temp. -45°C thru +85°C
Operating Temp. -40°C thru +65 °C

Regulatory Agencies



$$V = \frac{I \times R}{T_e} \quad V_L = V_{max} - \left[\frac{I \times DCR}{T_e} \right]$$

For best linearity, choose R such that $V < 0.8 V_L$

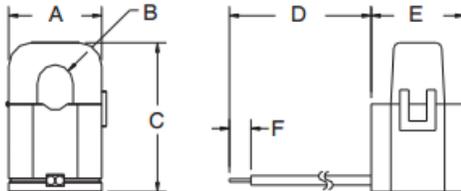


PART NUMBERS	
CR3109 - 1500	30 AMP
CR3110 - 3000	75 AMP
CR3111 - 3000	100 AMP
CR3113 - 2000	150 AMP

SPLIT CORE CURRENT TRANSFORMERS					
Part Number	I _{max}	V _{max} RMS	T _e (typ.)	DCR Ω	Frequency
CR3109-1500	30	5	1510	187	20 - 1 KHz
CR3110-3000	75	15	3100	515	20 - 1 KHz
CR3111-3000	100	19	3150	390	20 - 1 KHz
CR3113-2000	150	16	2125	58	20 - 1 KHz

I_p = Maximum Input Current to be linearly sensed V_{max} = Maximum Voltage (Saturation) CT will develop
T_e = Effective turns ratio including losses (All Specifications tested at 60 Hz)

OUTLINE DRAWING



Part Number	A	B	C	D	E	F
CR3109-1500	0.76 (19.2)	0.19 (4.90)	1.24 (31.5)	6.10 (1.55)	0.82 (20.8)	0.20 (5.08)
CR3110-3000	1.00 (25.5)	0.40 (10.2)	1.57 (40.0)	5.91 (150)	1.04 (26.5)	0.24 (6.10)
CR3111-3000	1.24 (31.4)	0.62 (15.7)	1.77 (45.0)	6.10 (155)	1.22 (31.0)	0.20 (5.08)
CR3113-2000	2.68 (68.7)	0.98 (24.9)	2.56 (65.0)	118 (3000)	0.72 (18.4)	0.20 (5.08)



3500 Scarlet Oak Blvd. St. Louis MO USA 63122 V: 636-343-8518 F: 636-343-5119
Web: <http://www.crmagnetics.com> 100 E-mail: sales@crmagnetics.com

APPENDIX F: Omron D6F-P0010A Spec Sheet

OMRON

MEMS Mass Flow Sensor D6F-P

A Compact, High-performance Flow Sensor with Dust Segregation Structure.

- Built in Dust Segregation System (DSS) with cyclone flow structure, diverts particulates from sensor element.
- High resolution and repeatability, even at low flow rates.
- Barbed ports with connector or PCB terminals, or manifold mount with connector versions.
- Built in voltage regulator, temperature compensation and amplified output. Measure up to 200 LPM with a bypass setup.
- High accuracy of $\pm 5\%$ FS.
- RoHS Compliant



Ordering Information

Description	Case	Calibration Gas (See note 1.)	Flow Range	Mounting Method	Connection	Model
Flow Sensor	PBT	Air (See note 2.)	0-0.1 LPM	Flange mount	Lead terminals	D6F-P0001A1
			0-1 LPM		Connector	D6F-P0010A2
				Manifold mount	Connector	D6F-P0010AM2
						D6F-CABLE2
Cable Connector Assembly	---	---	---	---	---	D6F-CABLE2

- Note: 1. Can be calibrated for different gas types. Consult your Omron representative.
 2. Dry gas must not contain large particles, eg dust, oil, mist.
 3. Cable Assembly "D6F-CABLE2", used with D6F-P0010A2 and D6F-P0010AM2, is sold separately.

Specifications

Characteristics

Models	D6F-P0001A1	D6F-P0010A1	D6F-P0010A2	D6F-P0010AM2
Flow Range (See note 1.)	0 to 0.1 L/min.	0 to 1 L/min.		
Calibration Gas (See note 2.)	Air			
Flow Port Type	barbed fitting maximum outside dia. 4.9 mm			manifold mount
Electrical Connection	Lead terminal		Connector (3 wire)	
Power Supply	4.75 to 9.45 VDC			
Current Consumption	Max. 15 mA (no load, Vcc = 5 VDC)			
Operating Output Voltage	0.5 to 2.5 VDC			
Output Voltage Limits (Min and Max.)	0 VDC min. and 3.1 VDC max. (Lead resistance 10 k Ω)			
Accuracy and Temperature Characteristics	$\pm 5\%$ F.S. max. of detected characteristics at 25 °C, within -10 to +60 °C (typical test results within $\pm 2\%$ F.S.)			
Repeatability (Reference (typical))	$\pm 1.0\%$ F.S.		$\pm 0.4\%$ F.S.	
Case Material	PBT			
Degree of Protection	IP40			
Withstand Pressure	50 kPa (7 psi)			
Pressure Drop (Reference (typical))	0.19 kPa			0.48 kPa
Operating Temperature	-10 to +60°C (1 LPM versions) and -33 to +75°C (0.1 LPM version) with no icing or condensation (Storage: -40 to +80°C with no icing or condensation)			
Operating Humidity	35 to 85% RH with no icing or condensation (Storage: 35 to 85% RH with no icing or condensation)			
Insulation Resistance	20 M Ω (500 VDC between lead terminal and the case)			
Dielectric Strength	500 VAC, 50/60 Hz for 1 minute. (Leakage current typ. Max. 1mA) between lead terminals and case.			
Weight	8.5 g			8.0 g
Response Time (Reference (typical))	150 msec			

- Note: 1. Volumetric flow rate at 0°C, 101.3 kPa.
 2. Dry gas. (must not contain large particles, dust, oil, mist)

MEMS Mass Flow Sensor **D6F-P**

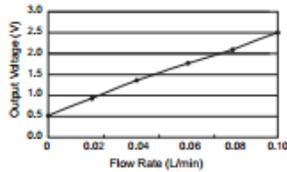
7

Absolute Maximum Rating

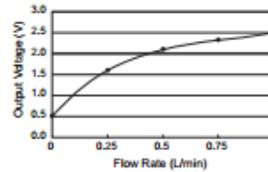
Item	Symbol	Rating	Unit
Power supply voltage	Vcc	10	VDC
Output voltage	Vout	4.0	VDC

Output Voltage Characteristics

D6F-P0001A□



D6F-P0010A□



D6F-P0001A□

Flow Rate (LPM)	0.00	0.02	0.04	0.06	0.08	0.10
Output Voltage (VDC)	0.50 ± 0.10	0.90 ± 0.10	1.30 ± 0.10	1.70 ± 0.10	2.10 ± 0.10	2.50 ± 0.10

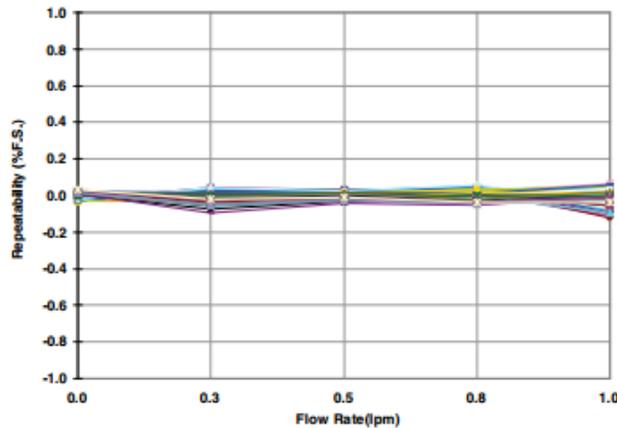
D6F-P0010A□

Flow Rate (LPM)	0.00	0.25	0.50	0.75	1.00
Output Voltage (VDC)	0.50 ± 0.10	1.60 ± 0.10	2.10 ± 0.10	2.31 ± 0.10	2.50 ± 0.10

Note: 1. Mass flow converted into volumetric flow rate, SLM (standard liters per minute) at 0°C, 1 atmosphere.
 2. 0 to 0.5 VDC output indicates a negative flow direction.
 3. Measurement condition: Power supply voltage of 5.0 ± 0.1VDC, ambient temperature of 25 ± 5 °C and ambient humidity of 35% to 75% RH.

Repeatability. (Typical test results)

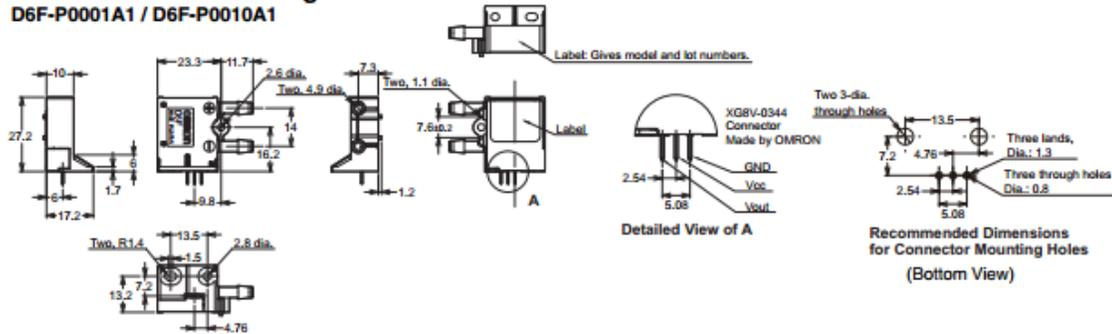
(5 Samples, D6F-P0010A□, repeated 10 times each)



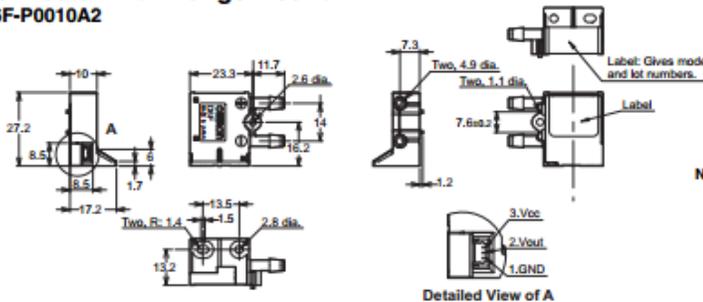
Dimensions

Note: All units are in millimeters unless otherwise indicated.

Lead terminals with Flange Mount D6F-P0001A1 / D6F-P0010A1



Connector with Flange Mount D6F-P0010A2



Note: 1. Use M3 or M2.6 pan screw or tapping screw with an equal diameter for installation. And bind tight with 0.59N-m or less torque.

2. Use an attached connector. Manufactured by JST Mfg Co., Ltd. (Japan) for A2 and AM2 types.

• Pressure welding connector

Socket: 03SR-3S

Wire: AWG#30

OR

• Crimp type connector

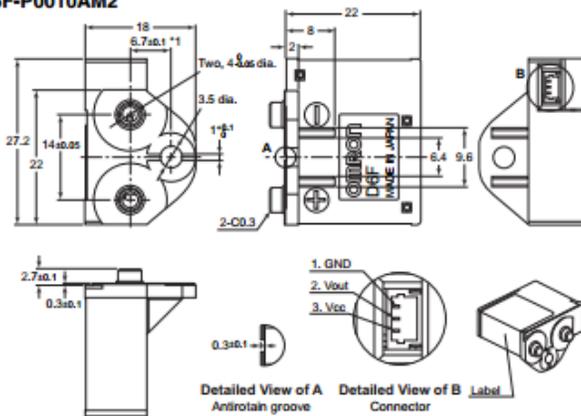
Contact: SSH-003T-P0.2]

Wire: AWG#32 to #28

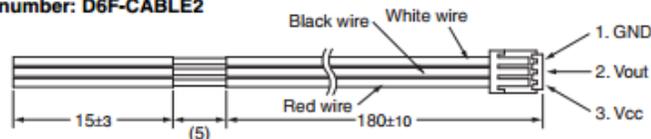
• Housing: SHR-03V-S

3. O-rings are not attached. 4mm ID tube recommended for D6F-P0010A1 and D6F-P0010A2 types.

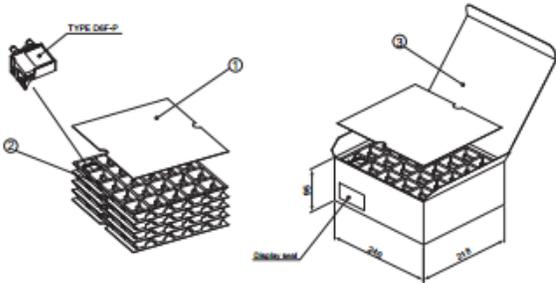
Connector with Manifold Mount D6F-P0010AM2



Applicable Cable for D6F-P0010A□2 (Optional - sold separately) part number: D6F-CABLE2



Packaging

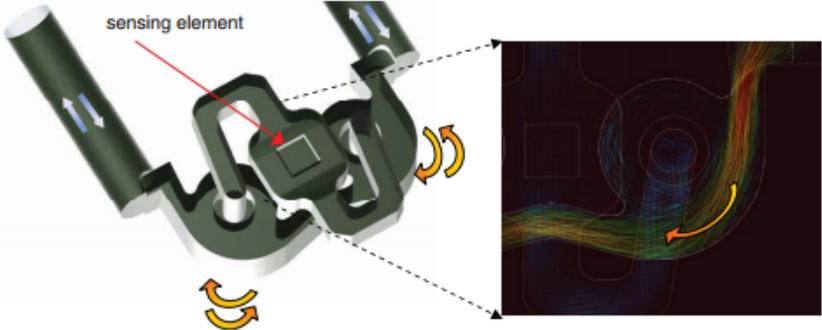


No.	Item	Material
1	Sock liner	CCNB
2	Tray (25pcs)	Polyethylene
3	Box (100 pcs)	CCNB

Application Information and Examples

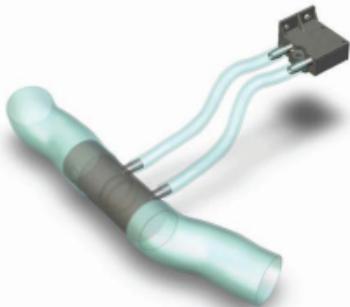
■ Bidirectional Dust Segregation System

The D6F-P series has a patented dust segregation design. The flow path incorporates dual centrifugal chambers, in which particulate matter follows in the outer path, away from the MEMS sensor chip regardless of the flow direction. Note, standard products are calibrated for unidirectional flow, as indicated in note 3 of the "Output Characteristics" table, above. Contact Omron for bidirectional calibration options.



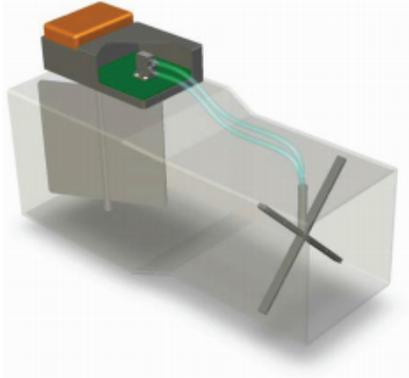
Bypass Setup

When used in a bypass set-up, as illustrated below, the D6F-P mass flow sensors can measure flow rates far beyond the 1 LPM in-line rating. The pressure differential required to pull airflow through the sensor can be accomplished by installing a flow restrictor between the two ports or through the use of a flow cross in large ducts, as shown in the HVAC application.



HVAC Application

The D6F-P mass flow sensor is ideal for damper control in variable air volume systems, where low flow rates are difficult to measure with differential pressure sensors.



Note: Be sure to read the precautions and information common to all D6F sensors, contained in the Technical User's Guide, "D6F Technical Information" for correct use.

APPENDIX G: Power

Some MultiSensors™ can operate on “parasitic power,” meaning that they use power from the data signal of the 1-Wire® bus with a capacitor to sustain them during the zeros. However, unlike most 1-Wire® devices, MultiSensors™ have an AUX jumper. The AUX jumper is already set to provide Vcc when shipped from the factory. This jumper connects the Vcc line on the sensor directly to the power source of the serial port (via the master LINK), providing a constant Vcc to the sensor independent of what the line signal is doing.

NOTE: If the AUX line of the master (LINK) is being used for another purpose, the jumper on the sensor must be removed.

APPENDIX H: MS-TH VOLTAGE AND ACCURACY

The MS-TH uses a supply voltage of 4.7V in perfect conditions instead of 5.0V. This is not due to a design issue. This is due to a protection diode put into the supply for the DS2438 and HIH-4000 used in the MS-TH in order to protect users from miswiring the product.

The protection diode creates a supply voltage drop of 0.3V, giving a final supply voltage of 4.7V in perfect conditions. In many conditions, the supply voltage is not perfect. There may be line loss, noise, or a 1-Wire master that has a protection diode. If accuracy is a major concern, it is recommended to test the supply voltage.

The HIH-4000 is ratiometric, so the output voltage is a percentage of the supply voltage. The DS2438 is not ratiometric, so it reports a value in the range of 0 – 10V based on an internal voltage reference that is not directly related to the supply voltage. Due to this, the result changes when the supply voltage changes.

The table below will help users to calculate the output voltage that should be received based on a given RH% and a Vsupply value, as well as the RH% based on a received voltage and a Vsupply value.

Alternatively, the equation to calculate %RH from voltage input is as follows:

$$\%RH = ((V_{input}/V_{supply}) - 0.16) / 0.0062$$

Base formula for HIH-4000	Vout=(Vsupply)(0.0062(sensor RH) + 0.16)	
Calculate Output voltage from given RH%		
Vsupply	4.700	Volts
Input RH	50.00%	% RH
.0062*RH	0.31000000	
Add 0.16	0.470	
Multiply by Vsupply for voltage reading	2.209000	Volts
Calculate %RH assuming 5.0V Vsupply		
Vsupply	4.700	Volts
Input Voltage	2.209	Volts
Divide by Vsupply	0.47	
Subtract 0.16	0.31	
Divide by 0.0062 for RH%	50.00%	%RH

Table 3: A table to help users calculate the output voltage based on a given RH% and a Vsupply value, as well as the RH% based on a received voltage and a Vsupply value.

Index

Accuracy	30	Link12	8, 11
ADC	5	Link45	8, 11
Air Pressure.....	12, 13	LinkTH.....	8, 11
AUX	29	Omron	13, 25
Casing	5	PDV-P8101	10, 23
Connectors	5	Pins.....	14
CR Magnetics.....	11, 24	Power	5
Current	11	Spec Sheet.....	6, 17, 23, 24, 25
Ethernet	5	Temperature	7, 8, 9, 10, 11, 12, 13
Honeywell.....	8, 17	Type Codes	15
Humidity	8	Voltage.....	9, 30
Light.....	10	Weather-proof.....	5

Glossary of Terms

A

Aux jumper

Short length of cable used to create a temporary additional connection between terminals

D

Differential air pressure

Pressure measured relative to the pressure in the atmosphere around it.

M

Master

The machine that communicates with the sensor and controls what comes in and out

P

Parasitic power

A device using power contained in data signals of the 1-Wire® busses, as well as a capacitor to keep it running during the zeros

PCB

Printed circuit board

R

Relative humidity

The ratio of water vapor in that air at a certain temperature to the amount of water vapor that the air could hold at that temperature; expressed as a percentage.

S

Slave

Sensors that communicate with the master

V

Vcc

Refers to voltage from a power supply connected to the “collector” terminal of a bipolar transistor.

VDC

Volts of direct current

Revision History

Date	Revision	Initials
7/11/16	<ul style="list-style-type: none">• Updated RJ-45 connection information and diagrams• Added Appendix H• Updated Table of Contents	SI
7/28/16	<ul style="list-style-type: none">• Updated product photos• Added revision history• Updated Table of Contents• Added version number to footer	SI