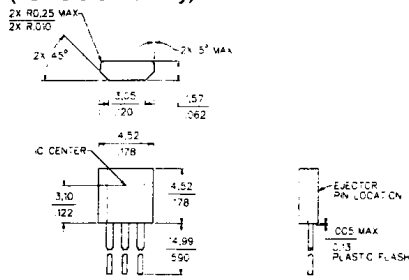


Magnetic Sensors Digital Output

2SSP



MOUNTING DIMENSIONS (For reference only)



OPERATION

2SSP Series position sensors have magnetoresistive material integrated on silicon and encapsulated in a plastic package. The integrated circuit provides a digital output in response to very low magnetic fields. Though this signal is identical to our digital Hall effect sensors, it can be achieved by magnetoresistive sensors at much greater sensor-to-magnet distances. For example, the 2SSP sensing distance is approximately one inch, when operated by a MICRO SWITCH 101MG3 magnet.

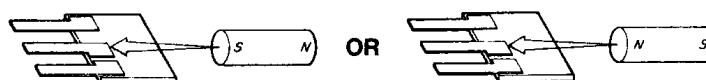
FEATURES

- Low gauss operation can extend sensing distance to one inch or more, depending on magnet size
- Digital current sinking output
- Omnipolar – can be operated with either North or South magnetic pole
- Operating speed: 0 to over 100 kHz
- Small size: .18 x .18 inch
- 3-pin, in-line PC board terminals on .100-inch mounting centers
- Operating temperature range: -20° to 85°C (-4° to 185°F)
- Parallel magnetic field operation

2SSP ORDER GUIDE

Catalog Listing	Supply Voltage (VDC)	Supply Current (mA)	Output Voltage (V)	Output Current (mA)	Magnetic Gauss @ 25°C Typ.		
					Op.	Rel.	Dif.
2SSP	6 to 24	13.5	.40 max.	20mA	15	11	4

OPERATING MODE

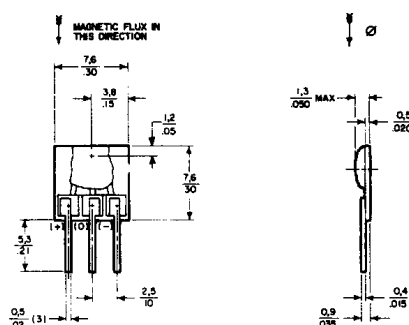


Magnetic Sensors Digital Output

SS2 Series



MOUNTING DIMENSIONS (For reference only)



OPERATION

SS2 Series position sensors have magnetoresistive material integrated on silicon and protected by an epoxy overcoat. The integrated circuit provides a digital output in response to very low magnetic fields. Though this signal is identical to our digital Hall effect sensors, it can be achieved by magnetoresistive sensors at much greater sensor-to-magnet distances. For example, the SS2 sensing distance is approximately one inch, when operated by a MICRO SWITCH 101MG3 magnet.

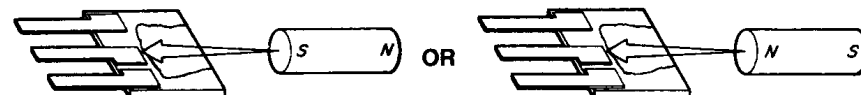
FEATURES

- Low gauss operation can extend sensing distance to one inch or more, depending on magnet size
- Digital current sinking output
- Omnipolar—can be operated with either North or South magnetic pole
- Operating speed: 0 to over 100 kHz
- Small size: .3 x .3 inch (with epoxy chip protection)
- 3-pin, in-line PC board terminals on .100-inch mounting centers
- Operating temperature range: -20° to 85°C (-4° to 185°F)
- Parallel magnetic field operation

SS2 SERIES ORDER GUIDE

Catalog Listing	Supply Voltage (VDC)	Supply Current (mA)	Output Voltage (V)	Output Current (mA)	Magnetic Gauss @ 25°C Typ.		
					Op.	Rel.	Dif.
SS21PE	4.5 to 5.5	10	.40	20	15	11	4
SS22PE	6 to 24	13.5	.40	20	15	11	4

OPERATING MODE



Magnetic Sensors Digital Output

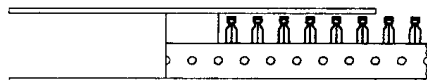
SS400 Series™

11

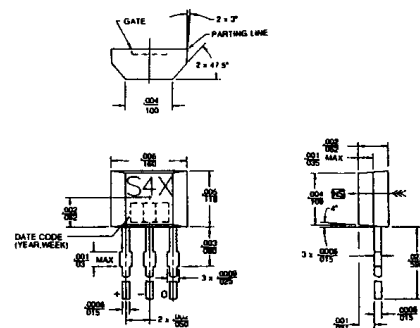
CONTROLS & SENSORS



TAPE AND REEL



MOUNTING DIMENSIONS (For reference only)



SS400 Series position sensors have a thermally balanced integrated circuit over full temperature range. The negative compensation slope is optimized to match the negative temperature coefficient of lower cost magnets. Bipolar, latching and unipolar magnetics are available.

Band gap regulation provides extremely stable operation over 3.8 to 24 VDC supply voltage range. SS400 sensors are capable of continuous 20 mA sinking output, and may be cycled as high as 50 mA maximum.

FEATURES

- 3.8-24 VDC supply voltage
- Digital current sinking output
- 3 pin in-line PCB terminals
- Quad-Hall design virtually eliminates mechanical stress effects
- Temperature compensated magnetics
- Operate/release points can be customized
- High output current capability – 50 mA absolute maximum
- Operate/release points symmetrical around zero gauss (bipolar/latch)
- Operating temperature range of – 55 to + 150°C (– 67 to + 302°F)

SS400 SERIES ORDER GUIDE

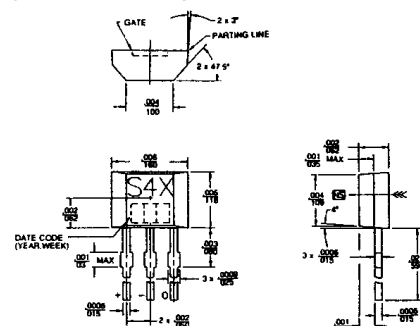
Catalog Listing	Magnetic Type	Supply Current (max.)	Output Voltage (max.)	Output Current (max.)	Magnetic Gauss @ 25°C Max.		
					Op.	Rel.	Dif.
SS411A	Bipolar	10 mA	.40 V	20 mA	60	–60	15
SS413A	Bipolar	10 mA	.40 V	20 mA	140	–140	20
SS441A	Unipolar	10 mA	.40 V	20 mA	115	20	20
SS443A	Unipolar	10 mA	.40 V	20 mA	180	75	25
SS449A	Unipolar	10 mA	.40 V	20 mA	380	245	30
SS461A	Latching	10 mA	.40 V	20 mA	85	–85	50
SS466A	Latching	10 mA	.40 V	20 mA	180	–180	200

Magnetic Sensors Digital Output, Bipolar

SS40 Series



MOUNTING DIMENSIONS (For reference only)



FEATURES

- 4.5 to 24 VDC supply voltage
- Small size (.160" x .118")
- Reverse power polarity protection
- Current sinking output
- Sensitive magnetic characteristics
- Operating speed from 0 to over 100 kHz
- Operating temperature range: –55° to 150°C

SS40 SERIES ORDER GUIDE

Catalog Listing	Magnetic Type	Supply Current (max.)	Output Voltage (max.)	Output Current (max.)	Magnetic Gauss @ 25°C Typ.		
					Op.	Rel.	Dif.
SS41	Bipolar	8.7 mA	0.40 mA	20 mA	40	–40	80
SS46	Latching	8.7 mA	0.40 mA	10 mA	100	–100	200

Magnetic Sensors Analog Output

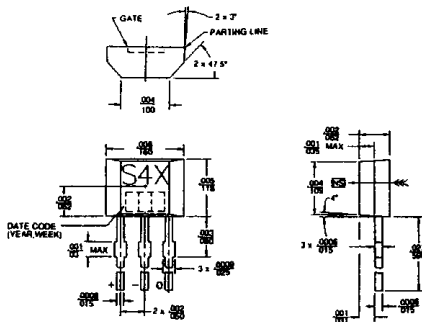
SS49/SS19 Series



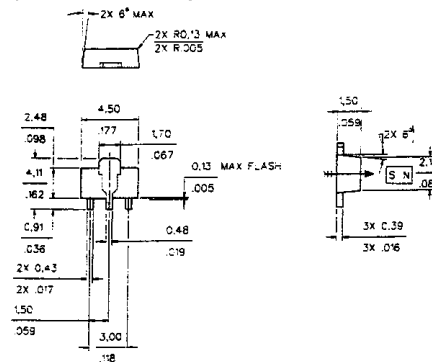
FEATURES

- 4 to 10 VDC supply voltage
- High output current sourcing capability – 10 mA continuous, 20 mA max.
- Ratiometric output
- Low supply current – 4 mA typ., for battery operation
- Very small, industry accepted packages
- Available on tape and reel for automated assembly
- Responds to North or South pole
- Linear output voltage over wide magnetic flux range

MOUNTING DIMENSIONS (For reference only)



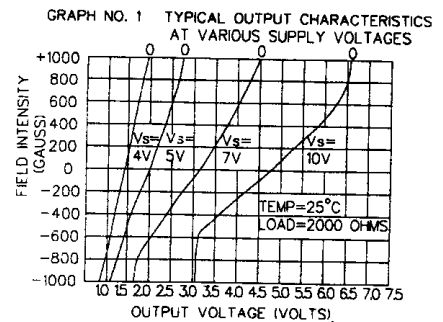
MOUNTING DIMENSIONS (For reference only)



TYPICAL LINEAR OUTPUT CHARACTERISTICS*

Graph #1

This graph displays the relationship between supply voltage and the combined effects of a change in sensitivity (gain) and null voltage output at room temperature. The sensitivity variation is represented by a change in the slope of the curve. The null voltage shifts the entire curve.

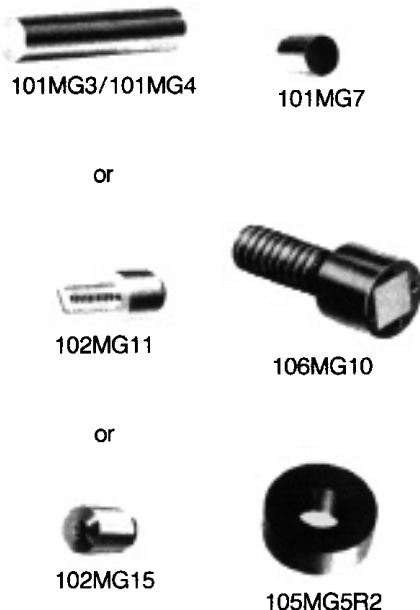


SS49/SS19 SERIES ORDER GUIDE

Catalog Listing	Supply Voltage	Supply Current	Output Voltage @ 0 gauss	Magnetic Characteristics Output	Gauss Range
SS49/SS19	4 to 10 VDC	4 mA typ.	1.75 to 2.25 V	0.60 to 1.25 mV/gauss	-400 and +400

Magnets

MG Series



MICRO SWITCH does not manufacture magnets. However, we do supply bar and ring magnets for operating our Hall effect sensors. The most common form of magnet used to operate a Hall effect sensor is the bar magnet. The magnet should provide at least 10% flux overdrive above "Max. Operate", when at minimum distance from the sensing surface.

Ring magnets are magnetized on the outside diameter with both North and South poles. Each pole pair (N and S) produces one pulse with standard Hall devices.

MG ORDER GUIDE – Bar Magnets

Catalog Listing	Length	Outside Diameter
101MG3	6,3/0.25	31,7/1.25
101MG2L1*	3,2/0.125	9,5/0.375
101MG7*	6,3/0.25	6,3/0.25
102MG11*	7,9/0.31	17,0/0.67
102MG15*	7,9/0.31	12,2/.48
103MG5**	2,0/.078	2,0/.078
106MG10*	10,2/0.40	23,6/0.93

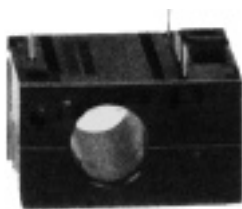
* Bulk packaging in 100 unit lots — ADD-BP to catalog listing.

** 125 pieces per tube. Poles not marked.

MG ORDER GUIDE – Ring Magnets

Catalog Listing	# Pole Pairs	Outside Diameter
105MG5R2	2	15,9/0.625
105MG5R4	4	15,9/0.625

CS Series



Each MICRO SWITCH CS series digital current sensor provides a logic level output that changes from approximately V_{cc} to 0.4 volts when the sensed current exceeds the operate point. Each digital sensor will operate on AC or DC current, but the output will turn off at every zero crossing when sensing AC current.

- Digital output
- AC or DC current sensing
- Through-hole design
- Fast response time, 100 μ sec
- Output voltage isolation from input
- Minimum energy dissipation
- Maximum current limited only by conductor size
- Accurate, low cost sensing
- Operating temperature range — 25 to 85°C

Catalog Listing	Operate Current @ 25° C (Amp-Turns)			Operate Current (Amp-Turns)	Release Current (Amp-Turns (Min.))	Supply Volt (Volts DC)	Output Volts	Output Current (mA) Sinking
	Min.	Nom.	Max.					
CSDA1BA	0.32	0.50	0.88	.25 to 1.0	0.08	6 to 16	0.4	20mA
CSDA1AA	0.32	0.50	0.88	.25 to 1.0	0.08	6 to 16	0.4	20mA

CS Series



- Linear output
- AC or DC current sensing
- Through-hole design
- Fast response time, 100 μ sec
- Output voltage isolation from input
- Minimum energy dissipation
- Maximum current limited only by conductor size
- Adjustable performance and built-in temperature compensation assures reliable operation
- Accurate, low cost sensing
- Operating temperature range – 25 to 85°C
- VCC/2 offset voltage

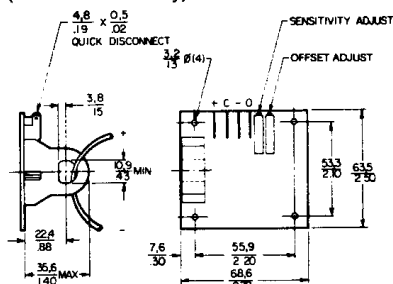
Catalog Listing	Supply Volt. (Volts DC)	Supply Current (mZ max.)	Sensed Current (Amps Peak)	Sensitivity mV/Nl		Offset Shift (%/°C)
				Nominal	± TOL	
CSLA1CD	8 to 16	19	57	49.6	5.8	± .05
CSLA1CE	8 to 16	19	75	39.4	4.4	± .05
CSLA1DE	8 to 16	19	75	39.1	4.8	± .05
CSLA2CD	6 to 12	20	72	32.7	3.0	± .02
CSLA2CE	6 to 12	20	92	26.1	2.1	± .02
CSLA2DG	6 to 12	20	150	16.2	1.1	± .02
CSLA2DJ	6 to 12	20	225	8.7	0.6	± .020

Current Sensors Adjustable Linear Output

CS Series



TYPICAL DIMENSIONS
(For reference only)



ADJUSTABLE LINEAR SENSORS DC/DC

This family is designed to provide a DC output voltage while sensing DC current. By adjusting the offset voltage trimpot the user can adjust the offset to one half of the supply voltage. The full scale current output voltage can be adjusted by the use of the sensitivity trimpot.

Can sense AC or DC current with optional industrial outputs. Other sizes available.

FEATURES

- $V_{cc}/2$ offset voltage
- 8 μ sec response time
- $\pm .03\%/^{\circ}\text{C}$ offset shift

DC/DC ORDER GUIDE RATIOMETRIC SINK/SOURCE OUTPUT

Catalog Listings	Max. Sensed Current (Amps-Peak)	Adjustable Operating Range @ $V_{cc} = 12 \text{ VDC}^*$			
		Min. Sens. (mV/NI)	Oper. Range (Amps)	Max. Sens. (mV/NI)	Oper. Range (Amps)
CSLB1AD	57	53	0-57	90	0-33
CSLB1AF	100	30	0-100	55	0-55

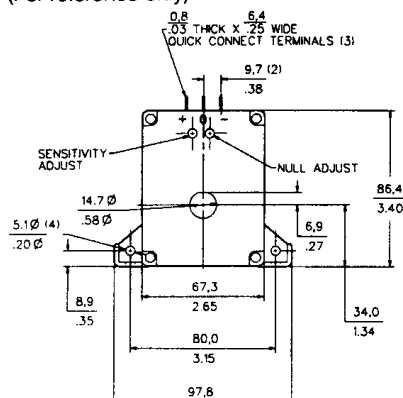
* For best results, choose a sensor to operate toward its maximum operate range. Increased amplification occurs when adjusting toward a minimum operate range; noise is also amplified.

Current Sensors Industrial Enclosed Linear Output

CS Series



TYPICAL DIMENSIONS
(For reference only)



GENERAL INFORMATION

CS Series solid-state industrial linear current sensors are completely enclosed to provide the circuitry and sensing elements a degree of protection from contaminants and physical damage. They detect variations in the flow of either alternating (AC) or direct (DC) current.

While monitoring current flow up to 1,000 amperes, these sensors produce a linear output signal (1 to 5 volts DC or 4 to 20 milliamps). This signal duplicates the waveform of the DC current being sensed and responds to peak AC current levels.

FEATURES

- Adjustable operating range
- Industrial standard 1 to 5 VDC or 4 to 20 mA output
- Regulated power supply accepts 10.5 to 24 VDC input
- AC or DC current sensing
- Through-hole design
- Fast response time, 150 msec
- Output voltage isolation from input
- Minimum energy dissipation
- Sensors available with adjustable performance feature
- Built-in temperature compensation
- Operating temperature range: -25° to 85°C (-13° to 185°F)
- Accurate, low-cost sensing
- 4mA offset current

ORDER GUIDE AC/DC SENSORS WITH 4.0 TO 20.0 MILLIAMPS SOURCE OUTPUT

Catalog Listing	Supply Current (mA max.)	Max. Sensed Current* (Amps-Peak)	Adjustable Operating Range			
			Min. Sens. ($\mu\text{A}/\text{NI}$)	Oper. Range (Amps)	Max. Sens. ($\mu\text{A}/\text{NI}$)	Oper. Range (Amps)
CSLF5HD	30	18	869.6	18	2666.7	6
CSLF5HE	30	92	173.9	92	533.33	30

* Optimum accuracy is obtained when operating the sensor at maximum sensed current.

Pressure Sensors Unamplified Gage Pressure

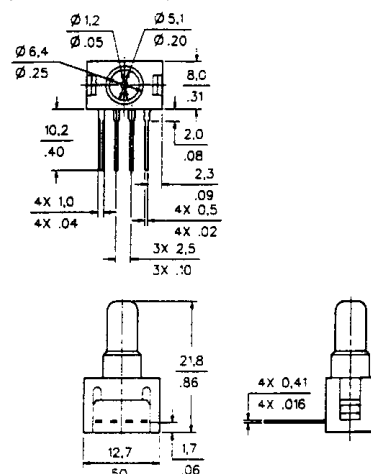
20PC Series;

11

CONTROLS & SENSORS



TYPICAL DIMENSIONS
(For reference only)



FEATURES

- Lowest priced sensor with temperature compensation and calibration
- Choice of termination for gage sensors
- Calibrated Null and F.S.O.
- Temperature compensated for F.S.O. over 0 to 50°C
- Provides interchangeability
- 10-16 VDC excitation
- $\pm 1.0\%$ F.S.O. linearity
- Compensated temperature range: 0 to 50°C

26PC SERIES ORDER GUIDE

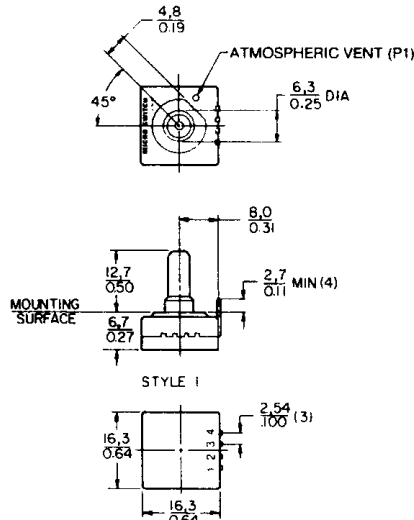
Catalog Listing	Pressure Range psi	Full Scale Output F.S.O., mV Typ.	Null Offset mV Typ.	Sensitivity mV/psi Typ.	Overpressure psi Max.
26PCBFA2G	5.0	50	0	10	20
26PCCFA2G	15	100	0	6.67	45
26PCDFA2G	30	100	0	3.33	60

Pressure Sensors Unamplified Gage

130PC Series



TYPICAL DIMENSIONS
(For reference only)



FEATURES

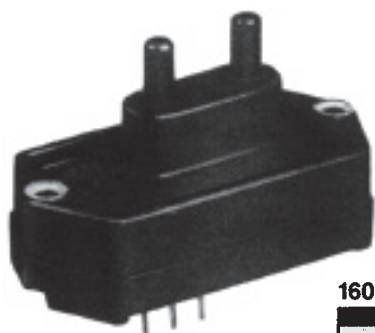
- Miniature package
- Can be used to measure with vacuum or positive pressure
- Absolute and gage sensors available
- Calibrated Null and F.S.O.
- Temperature compensated for F.S.O. over 0 to 50°C
- Provides interchangeability
- Lowest cost 1, 100 and 150 psi calibrated and temperature compensated sensor
- 10-16 VDC excitation
- Compensated temperature range: 0 to 50°C
- Typical null offset ± 0 mV

136PC SERIES ORDER GUIDE

Catalog Listing	Pressure Range psi	Full Scale Output F.S.O. Typ.	Sensitivity mV/psi Typ.	Overpressure psi Max.	Linearity, %F.S.O. P2 > P1 Max.
136PC15A1	0-15	100	6.67	45	± 1.00
136PC15A1L	0-15 (L)	40	2.67	60	± 0.50
136PC15A1L	0-30 (0-15L)	79	2.63	60	± 0.75
136PC01G1	0-1	20	20	20	± 1.00
136PC100G2	0-100	100	1.00	150	± 0.40
136PC150G2	0-150	60	0.40	225	± 0.40

Pressure Sensors Low Pressure Amplified, Differential

160PC Series



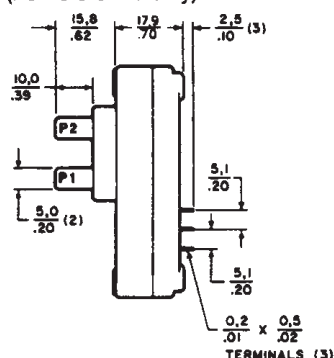
FEATURES

- Low pressure measurement
- PCB terminals on opposite side from the ports
- Optional color coded leadwires, 12 in., 24 gauge
- Fully signal conditioned
- 6-16 VDC excitation
- 8 to 20 mA supply current
- 5 Volt full scale output
- -18 to 63°C compensated temperature range

160PC SERIES ORDER GUIDE, DIFFERENTIAL TYPE

Catalog Listing	Pressure Range "H ₂ O	Null & Sensitivity Shift 25 to 5° 25 to 45°C Max.	Sensitivity V/"H ₂ O	Over-pressure psi Max.	Linearity, %F.S.O. P2 > P1 B.F.S.L. Max.	Repeatability & Hysteresis %F.S.O. Typ.
162PC01D	0-27.68	---	0.18	5	± 2.00	± 0.15
163PC01D36	± 5	± 1.00	0.50	5	± 2.00	± 0.25
164PC01D37	0-10	± 1.00	0.50	5	± 2.00	± 0.25
164PC01D76	0-5	± 1.25	1.00	5	± 2.00	± 0.25

TYPICAL DIMENSIONS (For reference only)



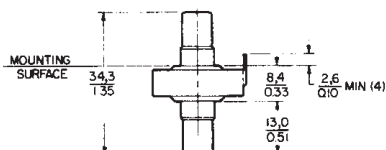
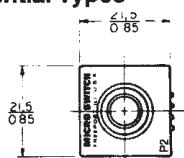
Pressure Sensors Unamplified Low Pressure Gage & Differential

170PC Series



MOUNTING DIMENSIONS (For reference only)

Differential Types



FEATURES

- Miniature package
- Low pressure measurement
- Calibrated Null and F.S.O.
- Temperature compensated for F.S.O. over 0 to 50°C
- Provides interchangeability
- 10-12 VDC excitation
- ± 2 mV null offset
- 0 to 50°C compensated temperature range

174PC SERIES ORDER GUIDE

Catalog Listing	Pressure Range "H ₂ O	Full Scale Output F.S.O., mV Typ.	Sensitivity mV/"H ₂ O Typ.	Overpressure "H ₂ O Max.	Linearity, %F.S.O. P2 > P1 Max.
176PC07HG2	0-7	28	4.00	140	± 3.00
176PC07HD2	0-7	28	4.00	140	± 3.00
176PC14HG2	0-14	35	2.50	140	± 3.00
176PC14HD2	0-14	35	2.50	140	± 3.00
176PC28HG2	0-28	42	1.50	140	± 3.00
176PC28HD2	0-28	42	1.50	140	± 3.00

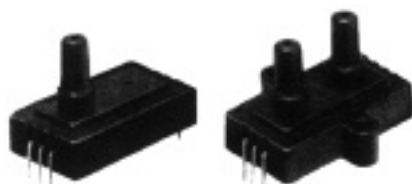
Pressure Sensors

Miniature, Differential, Gage, Amplified

180PC Series

11

CONTROLS & SENSORS



Terminal Mount

Housing Mount

FEATURES

- Miniature plastic package
- Terminal and housing mount styles
- PCB termination
- Fully signal conditioned
- 8 VDC excitation, typ.
- $1V \pm .05V$ null offset
- 5V full scale output
- 0 to 50°C compensated temperature range

185PC SERIES ORDER GUIDE, DIFFERENTIAL TYPE, P2 > P1

Catalog Listing	Pressure Range psi	Overpressure psi Max.	Linearity, P2 > P1 Max.	% F.S.O. P2 < P1 Max.
185PC05DT	0-5	20	± 2.00	± 1.00
185PC15DT	0-15	45	± 2.00	± 1.00
185PC30DT	0-30	60	± 1.50	± 0.75

186PC SERIES ORDER GUIDE, BI-DIRECTIONAL TYPE, P2-P1

Catalog Listing	Pressure Range psi	Overpressure psi Max.	Linearity, P2 > P1 Max.	% F.S.O. P2 < P1 Max.
186PC03DT	± 2.5	20	± 2.00	± 1.00
186PC05DT	± 5.0	20	± 2.00	± 1.00
186PC15DT	± 15	45	± 2.00	± 1.00

HOW TO ORDER

Catalog listings in the order guide are shown with mounting version T (terminal mount). To order version H (housing mount), change the "T" to "H".

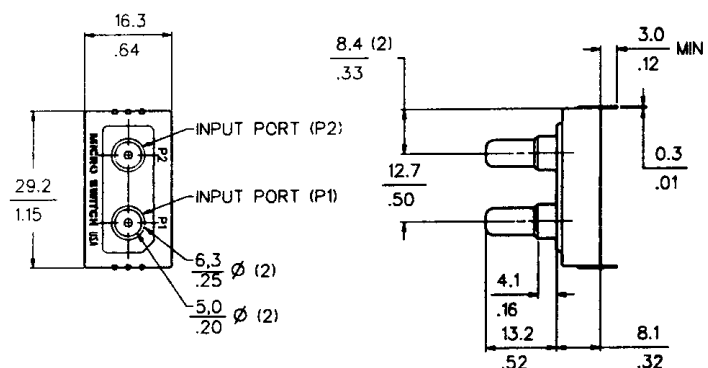
Example: 184PC05GT converted to a housing mount version becomes 184PC05GH.

TYPICAL DIMENSIONS

(for reference only)

Terminal Mount

(Differential "D" or Absolute "A" Housing)



At Relay Specialties.
Customers are our most important asset.

AWM3000 Series



- Laser trimmed for interchangeability
- Flow sensing up to 1.0 LPM
- 5 VDC output @ laser trim point
- 1 VDC null voltage
- 8 to 15 VDC excitation
- 3m sec. response time
- -25 to 85°C temperature range
- Ratiometric output voltage

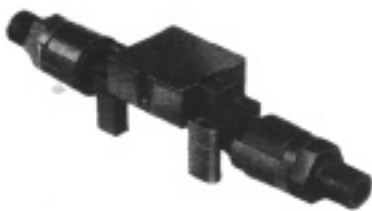
Dust contamination is possible in some airflow applications, but can be minimized. Dust particles in the airstream flow past the chip parallel to its surface. In addition, the microstructure is kept clean by a thermophoretic effect, which impels the micrometer-sized dust particles away from the structure. In an accelerated operating life test, with less than 50 sccm flow, a lifetime equivalent to over 20 years in a typical industrial air environment was achieved with no degradation of sensor response.

Two Wheatstone bridges control airflow measurement – one provides closed loop heater control, the other contains the twin sensing elements. The heater circuitry, operational amplifier, and precision thick-film resistors are located on the ceramic substrate. Ambient temperature is sensed by a similar heatsunk resistor on the chip.

Clogging due to dust adherence to chip edges and channel surfaces can be substantially eliminated through the use of a simple filter. The optimum filtering action is obtained with a low impedance filter in series with the small cross-section and high flow impedance of the channel. This permits a large accumulation of dust in the filter without significant change in the combined impedance. Where filtering is desired, a disposable five-micron filter may be used upstream of the flow sensor.

Catalog Listing	Flow Range	Null Voltage Shift – 25 to 85°C	Output Voltage Shift 25 to – 25°C 25 to 85°C	Repeatability & Hysteresis
AWM3200V	+ 60 sccm, (± 20 scc.)/ + 2.0 " H ₂ O	± 100 mV	+ 24.00% F.S.O. – 7.0% F.S.O.	± 0.50% F.S.O. max.
AWM3100V	+ 200 sccm/ + 2.0 " H ₂ O	± 50 mV	+ 6.0% F.S.O. – 24.0% F.S.O.	± 0.50% F.S.O. max.
AWM3300V	+ 1000 sccm/ + 1.3 ± 1 " H ₂ O	± 50 mV	+ 6.5% F.S.O. – 9.0% F.S.O. type	± 1% F.S.O. typ.

AWM5000 Series

[illegible]

- Variety of flow connections possible
- Venturi design
- Remote mount
- Active laser trimmed to CO₂, N₂ or argon calibration
- 8 to 15 VDC excitation
- Linear output, 1 to 5 VDC
- -20 to 70°C temperature range
- Null output, 1 VDC

AWM5000 Series Microbridge Mass Airflow Sensors feature a venturi type flow housing. They measure flow as high as 20 standard liters per minute (SLPM) while inducing a maximum pressure drop of 2.25" H₂O. The microbridge chip is in direct contact with the flow stream, greatly reducing error possibilities due to orifice or bypass channel clogging.

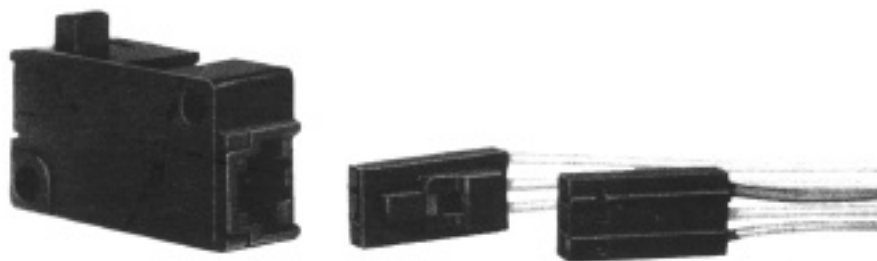
Catalog Listing	Flow Range
AWM5101VA	5 SLPM, Argon calibration
AWM5101VC	5 SLPM, CO ₂ calibration
AWM5101VN	5 SLPM, N ₂ calibration
AWM5102VA	10 SLPM, Argon calibration
AWM5102VC	10 SLPM, CO ₂ calibration
AWM5102VN	10 SLPM, N ₂ calibration
AWM5103VA	15 SLPM, Argon calibration
AWM5103VC	15 SLPM, CO ₂ calibration
AWM5103VN	15 SLPM, N ₂ calibration
AWM5104VA	20 SLPM, Argon calibration
AWM5104VC	20 SLPM, CO ₂ calibration
AWM5104VN	20 SLPM, N ₂ calibration

Hall Effect Switches Mechanically Operated

VX Series

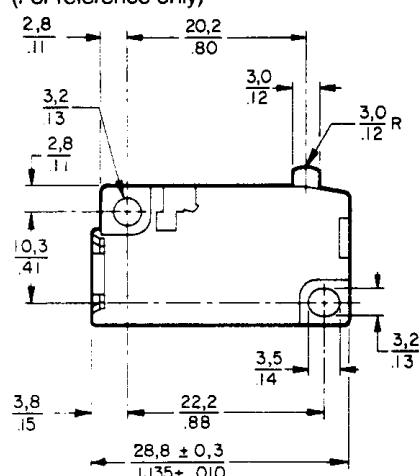
11

CONTROLS & SENSORS



TYPICAL DIMENSIONS

(For reference only)



FEATURES

- Hall effect sensor operated by magnet in plunger
- Low force operation
- 4.5 to 24 VDC supply voltage
- -40°C to +70°C operating temperature
- Direct interface to solid state circuits
- Reverse voltage protection
- Digital current sinking, normally high or normally low output (10 mA)
- Wide variety of actuators . . . uses all standard MICRO SWITCH V3 levers*
- Industry standard mounting holes
- No external terminals . . . uses standard keyed and locking plug-in connectors

Termination

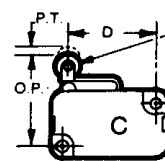
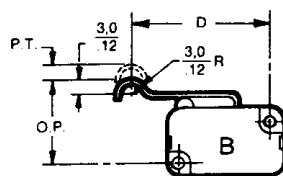
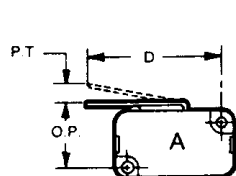
Terminal pins accept connectors (not furnished).

1. AMP 102241-1
MICRO SWITCH part number:
VX1A — connector & receptacle unassembled.
VX1A-01 — connector & receptacle pre-assembled with 5.4", 24 gauge lead wires.

VX SERIES ORDER GUIDE

Catalog Listing		Operating Force Ounces	Max. Free Position	Operating Point	Overtravel (Min.)	Differential Travel (Max.)
Normally High	Normally Low					
VX10	VX11	.35 \pm .18 -.14	.645	.580 \pm .02	.040	.014
VX80	VX81	3.0 \pm .88				

Actuating lever examples.



4.8/19 DIA X 4.8/19 WIDE
OIL BRONZE ROLLER
(CONCENTRICITY 0.13/.005 TIR)

SERVICE

Is Not Just a Word.
It is a Promise.