

9960 SERIES

HALL EFFECT SENSOR



Introduction

Model 9960 Hall effect rotary position sensors are available in numerous standard configurations with fast, one week delivery. Available configurations include 7 termination options, single or dual outputs and 24 active electrical angles. With 360 degree turn capability, the 9960 can be used over a large range of rotary motion making it extremely versatile.

Packaged in a highly sealed (IP69K) housing and utilizing non-contacting Hall effect technology makes the 9960 an exceptionally rugged and reliable sensor. Model 9960 is ideal for a variety of applications in harsh environments, including steering and pedal positioning for construction, agriculture and mining vehicles, marine steering and speed control, wheel and throttle position for material handling equipment, and valve position for process control.

SPECIFICATIONS

Mechanical

Mechanical Travel	Continuous 360 degree and option for 180 degree mechanical stops
Operating Torque	0.11 N-m maximum
Weight	80 g (w/ 6" cable)
Mounting	38mm mounting center
Drive	Blade Ø9.53 x 2.16 wide
Termination	Flying leads, wire harness w/connector or integral connector (see ordering options)

Electrical

Active Electrical Angle	15°-360° in 15° increments (no spring)
Input Voltage	5VDC ±5%, 9-30VDC or 15-30VDC
Input Current	(per channel) 16mA maximum except for Current Loop option at 36mA max
Overvoltage	5V Input: 20VDC 9-30V Input: 70V per ISO 7637-2
Output Signal	Analog: 1) ratiometric 5% to 95% or 10% to 90% 2) non-ratiometric 0-10VDC, 0-5VDC, 0.5-4.5VDC
	PWM: duty cycle 5% to 95% or 10% to 90%
	Current: 4-20 mA (3-wire)
Output Load	Analog & PWM: 10kOhm resistive minimum
	Current: 400Ohm resistive maximum
Resolution	0.088 degrees (12-bit)

Accuracy	±0.6% of Active Electrical Angle at room temperature ±0.9% of Active Electrical Angle at temperature
EMC	200 V/m
External Magnetic Susceptibility	20G

Environmental

Sealing	IP67, IP69K
Side Load	1kg (1 million cycles)
Temperature Range	Operating Temperature: -40°C to +125°C 4-20mA versions 9J, 9K, & 9X1: -40°C to 85°C
	Storage Temperature: -55°C to +150°C
Mechanical Resistance	Vibration: 10G peak, 10-2000 Hz
	Shock: 50Gs, half sine pulse, 11 m sec duration

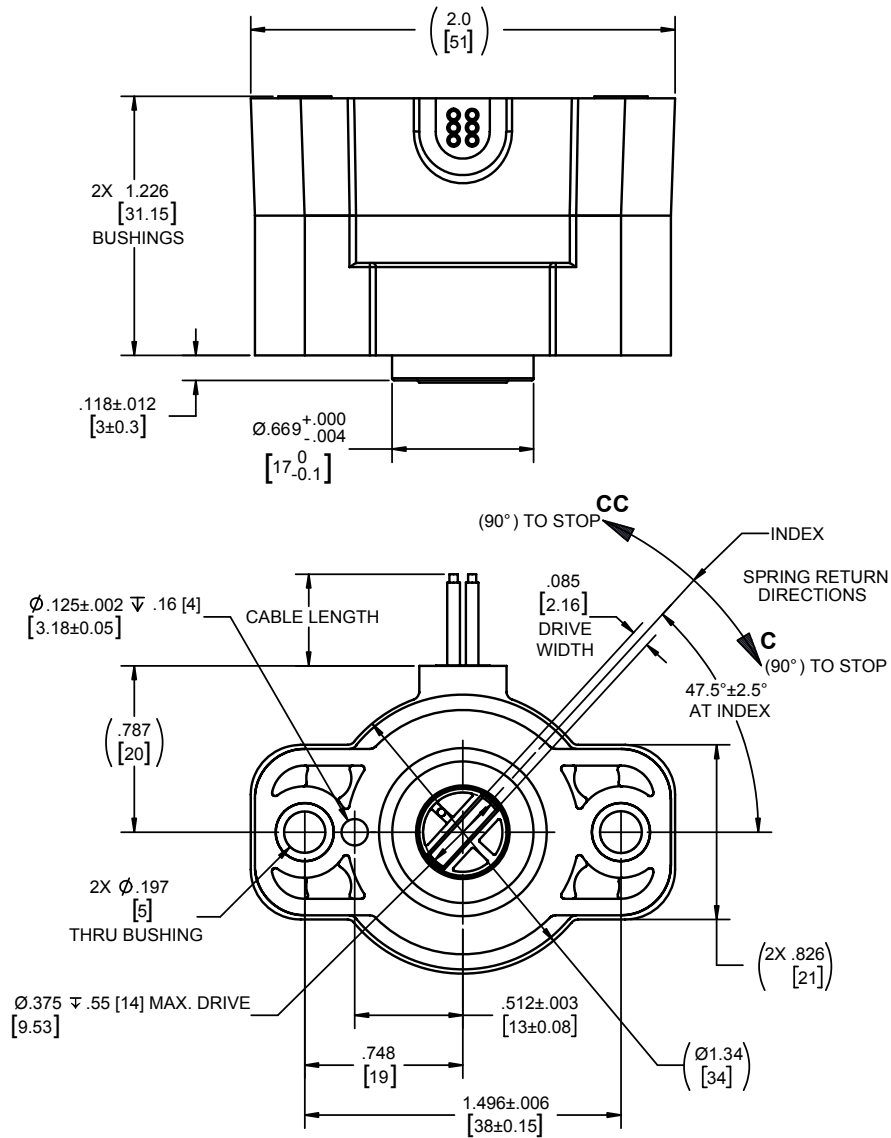


DIMENSIONS

All dimensions are in INCHES [MM].

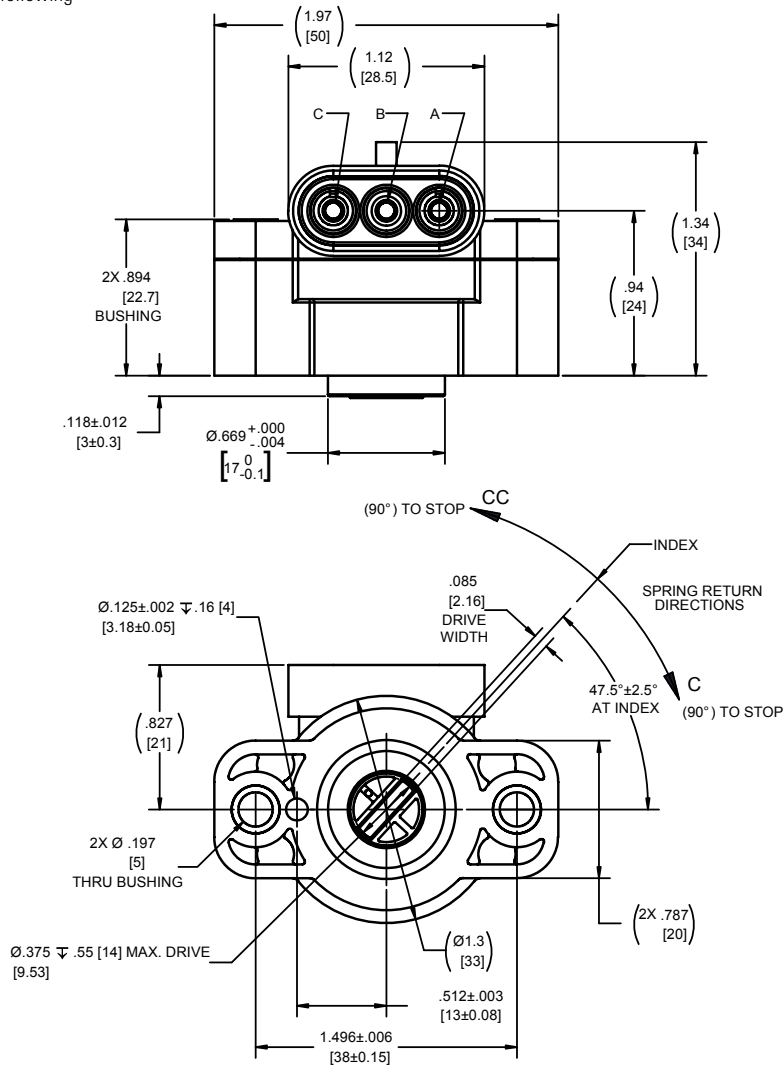
Tolerances unless otherwise noted.. X.XX= ± .012 [±0.3] X.XXX= ± .005[±0.13]

SL, DL, OPTION



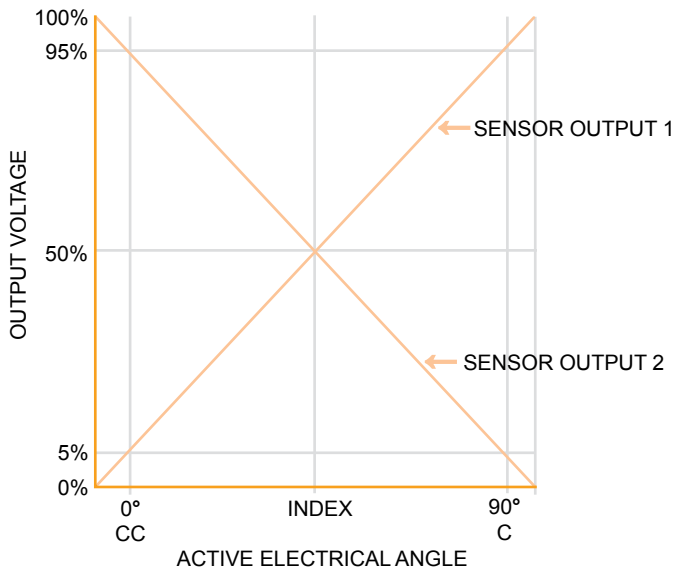
SW OPTION

For other pinout options refer to the pinout and connector sections following the ordering options on the pages following



OUTPUT WAVEFORMS

(OPTION 5A WITH 90 $^\circ$ ELECTRICAL ANGLE SHOWN)





ORDERING OPTIONS

Use this diagram, working from left to right to construct your model number

(PWM example: 9960-015-C-5EP1-SL150)

(Ratiometric example: 9960-180-NS-SA-DD300)

(Reprogrammable example: 9960-X-C-9X2-DA450)

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Family

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Standard Electrical Angles

Standard Angles: 015, 030, 045, 060, 075, 090, 105, 120, 135, 150, 165, 180, 195, 210, 225, 240, 255, 270, 285, 300, 315, 330, 345, 360
X: Programmable Angle (used with I/O options 5X1, 5X2, 9X1, 9X2, 15X)
NOTE: Other angles available, consult factory
(Ex: 015 = 15°±7.5; 360 = 360°±180)

Spring/ Rotor Return Direction

C: CLOCKWISE SPRING RETURN*
CC: COUNTERCLOCKWISE SPRING RETURN*
NS: NO SPRING RETURN, CONTINUOUS ROTATION

* Spring return: available for active electrical angles 15° to 165°, not available from 180° to 360°.

Input/ Output (I/O)

5 VDC IN, Ratiometric Voltage OUT

5A: SENSOR1: 5% to 95%; SENSOR2: 95% to 5%
5B: SENSOR1: 95% to 5%; SENSOR2: 5% to 95%
5C: SENSOR1: 10% to 90%; SENSOR2: 90% to 10%
5D: SENSOR1: 90% to 10%; SENSOR2: 10% to 90%
5X1: SENSOR1 and SENSOR2: Programmable

5 VDC IN, PWM OUT

5E: SENSOR1; 5% to 95%; SENSOR2: 95% to 5%
5F: SENSOR1; 95% to 5%; SENSOR2: 5% to 95%
5G: SENSOR1; 10% to 90%; SENSOR2: 90% to 10%
5H: SENSOR1; 90% to 10%; SENSOR2: 10% to 90%
5X2: SENSOR1 and SENSOR2: Programmable

9-30 VDC IN, CURRENT OUT(1)

9J: SENSOR1: 4-20 mA; SENSOR2: 20-4 mA

9K: SENSOR1: 20-4 mA, SENSOR2: 4-20 mA

9X1: SENSOR1 and SENSOR2: Programmable

9-30 VDC IN, VOLTAGE OUT(1)

9L: SENSOR1: 0-5 VDC, SENSOR2: 5-0 VDC
9M: SENSOR1: 5-0 VDC, SENSOR2: 0-5 VDC
9N: SENSOR1: 0.5-4.5 VDC, SENSOR2: 4.5-0.5 VDC
9R: SENSOR1: 4.5-0.5 VDC, SENSOR2: 0.5-4.5 VDC

9X2: SENSOR1 and SENSOR2: Programmable

15-30 VDC IN, VOLTAGE OUT(1)

15S: SENSOR1: 0-10 VDC, SENSOR2: 10-0 VDC
15T: SENSOR1: 10-0 VDC, SENSOR2: 0-10 VDC
15X: SENSOR1 and SENSOR2: Programmable

NOTE: Output with clockwise rotation of rotor. SENSOR1 specifies single SENSOR option

PWM Frequency

(Used with 5E, 5F, 5G, 5H and 5X2 I/O options only; leave blank for other output options)

P1: 100 Hz

P2: 200 Hz

P3: 500 Hz

P4: 1000 Hz

Number of Outputs and Termination Options

SL: Single Output, Flying Leads

DL: Dual Output, Flying Leads

SA: Single Output, Cable W/Tyco AMP Superseal 1.5 Series*

DA: Dual Output, CableW/ Tyco AMP Superseal 1.5 Series *

SD: Single Output, Cable W/Deutsh DT04 Series *

DD: Dual Output, Cable W/Deutsh DT04 Series *

SM: Single Output, Cable W/ Packard Electric Metripack 150 Series*

DM: Dual Output, Cable W/ Packard Electric Metripack 150 Series*

SW: Single Output, Integral 3-PIN Weatherpack Connector (no cable length necessary)*

* Single Outputs= 3-PIN, Dual Output= 6-PIN

Cable Length

150: 150mm (~6 inches)

300: 300mm (~12 inches)

450: 450mm (~18 inches)

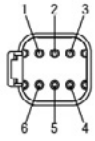
NOTE: Other lengths available, consult factory



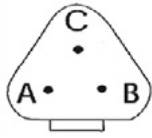
PIN OUT DRAWINGS

All dimensions are in INCHES [MM].

1 (DD)



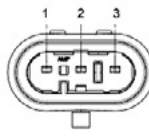
2 (SD)



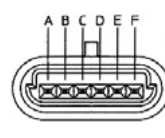
3 (DA)



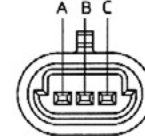
4 (SA)



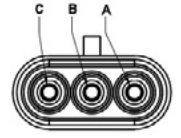
5 (DM)



6 (SM)



7 (SW)



CONNECTOR PIN OUT

Dwg 1	Dwg 2	Dwg 3	Dwg 4	Dwg 5	Dwg 6	Dwg 7	Flying Lead	Flying Lead		
Pin Number							3-Wire	6-Wire	Wire Color	Function
1	A	1	1	E	A	A	•	•	Brown	GND 1
2	B	2	2	F	B	C	•	•	Red	Supply Voltage 1
3	C	3	3	C	C	B	•	•	Orange	Sensor 1 Output
4		4		A				•	Green	Ground 2
5		5		B				•	Blue	Supply Voltage 2
6		6		D				•	Yellow	Sensor 2 Output



CONNECTOR PART NUMBERS AND MATES

Dwg	Connector	Mates to
1	Deutsch: DT04-6P	DT06-6S
2	Deutsch: DT04-3P	DT06-3S
3	Amp Superseal: 1.5V; 282108-1	282090-1
4	Amp Superseal: 1.5V; 282105-1	282087-1
5	Packard Electric Metripack 150.2	12162210
6	Packard Electric Metripack 150.2	12162182
7	Packard Electric Weather Pack	12015793

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