9960 Series
Hall Effect Rotary Position Sensor

BEI Sensors

Product shown with flying lead.Multiple termination options available. See ordering options.

BEI Sensors' 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.

Mechanical Specifications

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
Termination: Flying leads, wire harness w/connector or integral connector (see ordering options)

Electrical Specifications

Active Electrical Angle: 15-360° in 15° increments
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)
Minimum Load Resistance: 10kOhm resistive
Resolution: 0.088 degrees (12-bit)
Accuracy: +/-0.6% of Active Electrical Angle

Environmental Specifications

Sealing: IP67, IP69K
Side Load: 1kg (1 million cycles)
Vibration: 10G peak, 10-2000 Hz
Shock: 50Gs, half sine pulse, 11 m sec duration
EMC: 200 V/m
External Magnetic Susceptibility: 20G
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

9960 Series Ordering Options for assistance, call 800.350.2727

Use this diagram, working from left to right to construct your model number (example: 9960-015-C-5EP1-SL150)

9960 – [ ] – [ ] – [ ] [ ] – [ ] [ ]

STANDARD ACTIVE ELECTRICAL ANGLES::
(enter angle in degrees) = 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
(Ex: 015 = 15°; 360 = 360°)
X = Programmable Angle (used with I/O options 5X1, 5X2, 9X1, 9X2, 15X)
NOTE: Other angles available, consult factory

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°.

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

CABLE LENGTH:
150 = 150mm (~6 inches)
300= 300mm (~12 inches)
450= 450mm (~18 inches)
NOTE: Other lengths available, consult factory

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
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
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
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

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, CABLE W/ TYCO AMP SUPERSEAL 1.5 SERIES *
SD = SINGLE OUTPUT, CABLE W/DEUTSCH DT04 SERIES *
DD = DUAL OUTPUT, CABLE W/DEUTSCH 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

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Specification No.: 02133
A brand of CST
Rev 8-5-13

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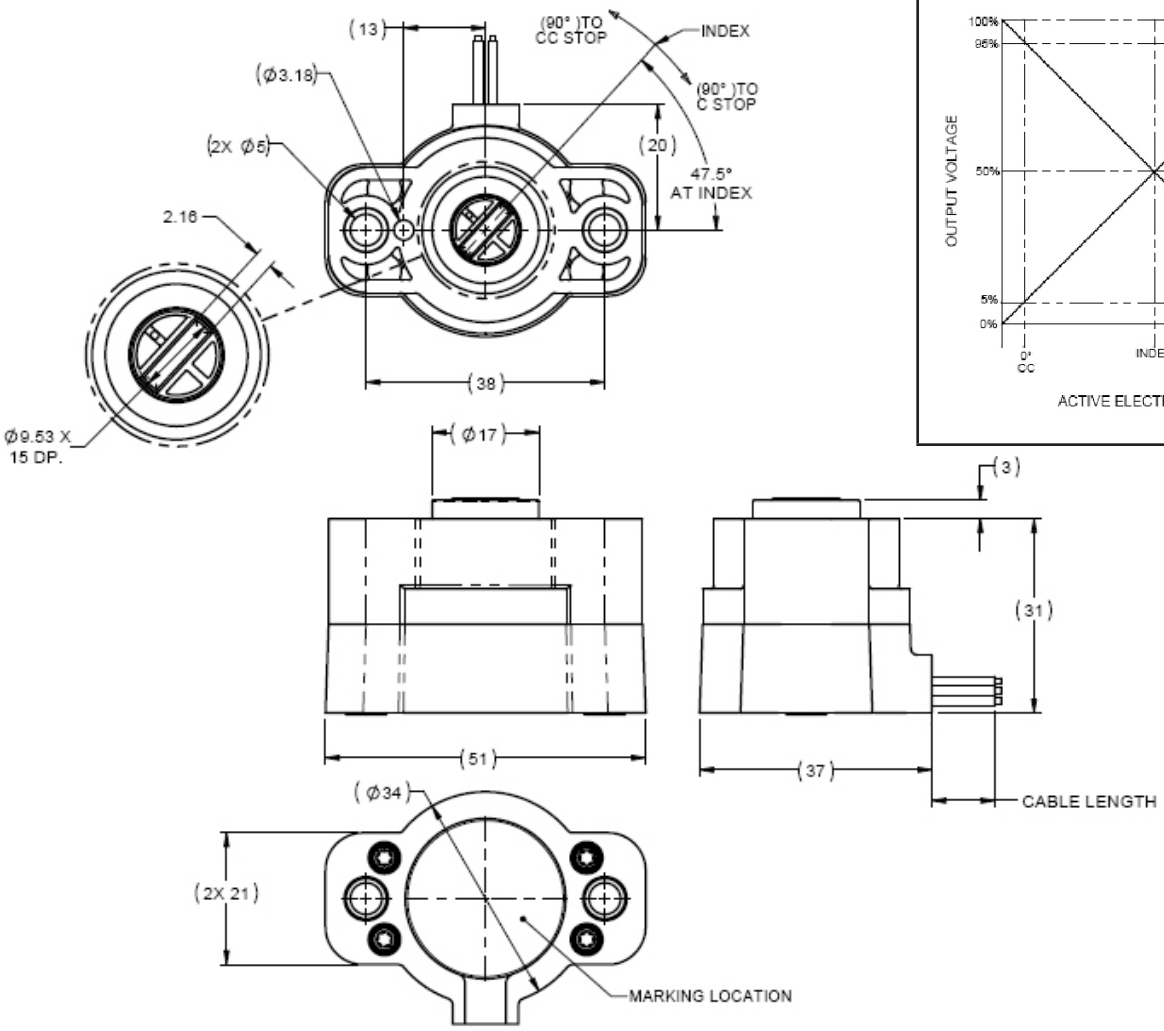
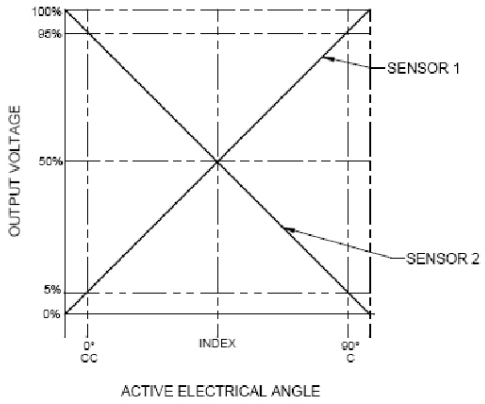
Dimensions



Output Example

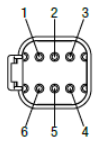
(Option 5A with 90° electrical angle shown)



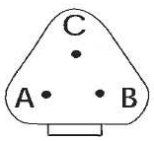
Dimensions in mm

Pin Out Drawings

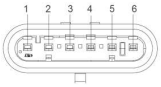
1 (DD)



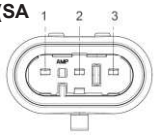
2 (SD)



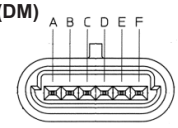
3 (DA)



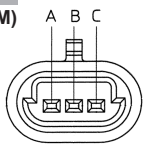
4 (SA



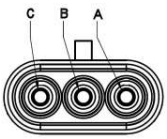
5 (DM)



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
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: 1.5;282108-1	282090-1
4	Amp Superseal: 1.5;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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