SB100A
Magnetic Pulse Pickup

BLN-95-8980-4 **Issued**: February 1992

DESCRIPTION

The SB100A is a self-generating variable reluctance speed sensor that is designed for rugged outdoor, mobile, or heavy industrial applications. It can be used for measurement, control, alarm, or counting functions that require no physical contact with the sensed shaft, gear, or sprocket.

While measuring the speed of a rotating gear or similar toothed element, the SB100A output will be an alternating voltage. The amplitude and frequency will vary in proportion to the speed of the gear teeth passing by the sensor.

TECHNICAL DATA

DC RESISTANCE
500 ± 100 ohms

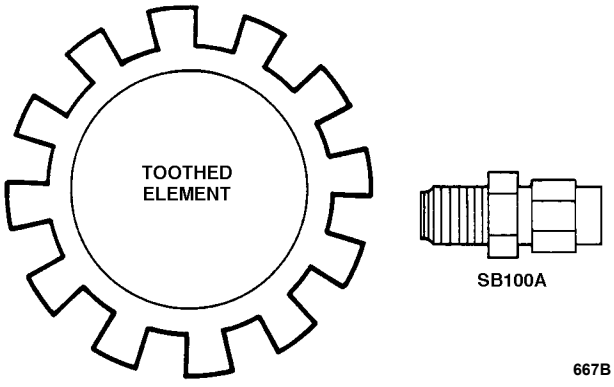
MECHANICAL SHOCK RATING
50 g's in any axis

ELECTRICAL CONNECTIONS
Two conductor integral connector mates with standard 1/4-inch female quick-connect terminals (not furnished) such as Belden #7478.

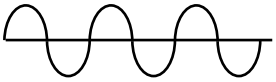
OUTPUT
1. In relation to peripheral speed - see Graph 1
2. In relation to gap distance - see Graph 2
3. In relation to lateral displacement - see Graph 3
4. In relation to load impedance - see Graph 4
5. In relation to ambient temperature - see Graph 5

TYPICAL GAP DIMENSION
Gap dimension is the distance between the pole end of the SB100A and the rotating element. The SB100A will produce 0.41 Volts peak-to-peak with a 1 kilohm load when placed 3.2 millimeters (.125-inch) from a 12.7 millimeter (1/2-inch) pitch chain sprocket rotating at a peripheral speed of 785 centimeters per second (310 inches per second).

BLOCK DIAGRAM



$$f\,(Hz) = \frac{N - RPM}{60}$$



N = Number of teeth
RPM = Revolutions per minute

Typical Output From Sensor Coil.

FEATURES

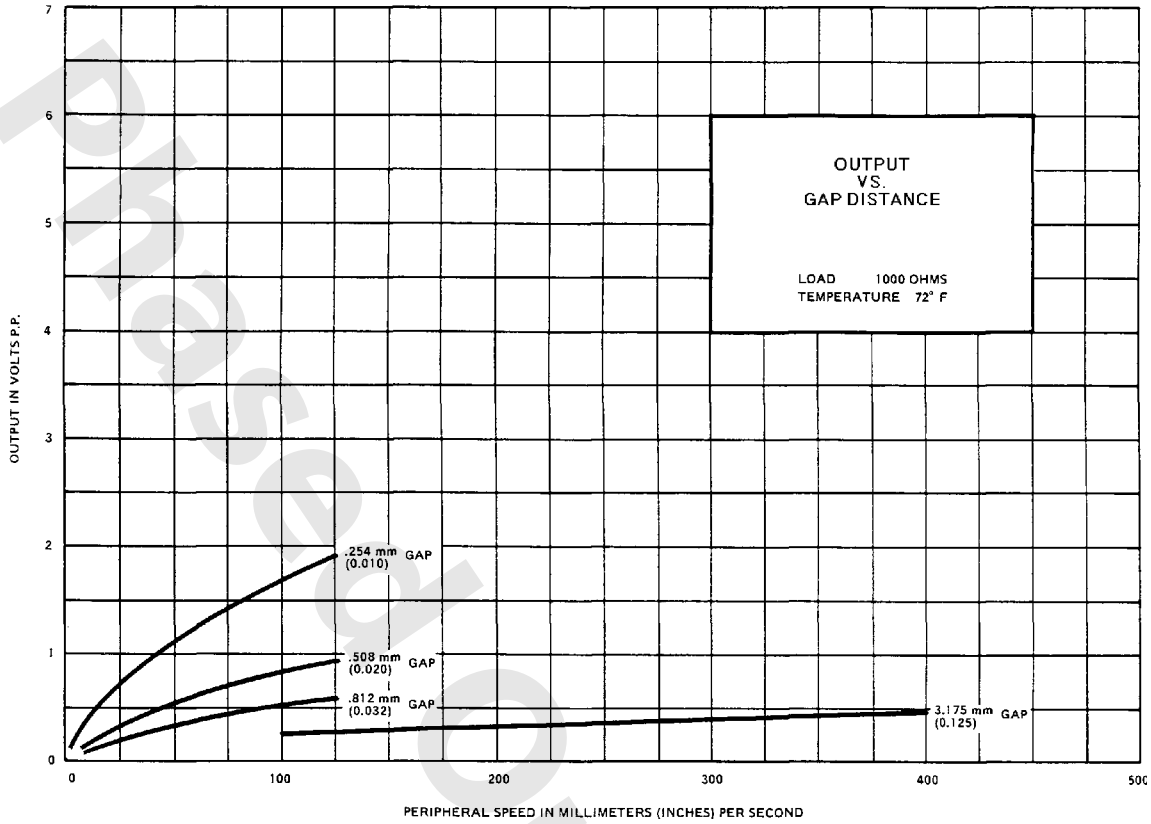
- Protected against reverse polarity and shorts
- Resistant to shock and vibration

ORDERING INFORMATION

SPECIFY

MODEL NUMBER	LENGTH
SB100A1017	Standard
SB100A1025	Long

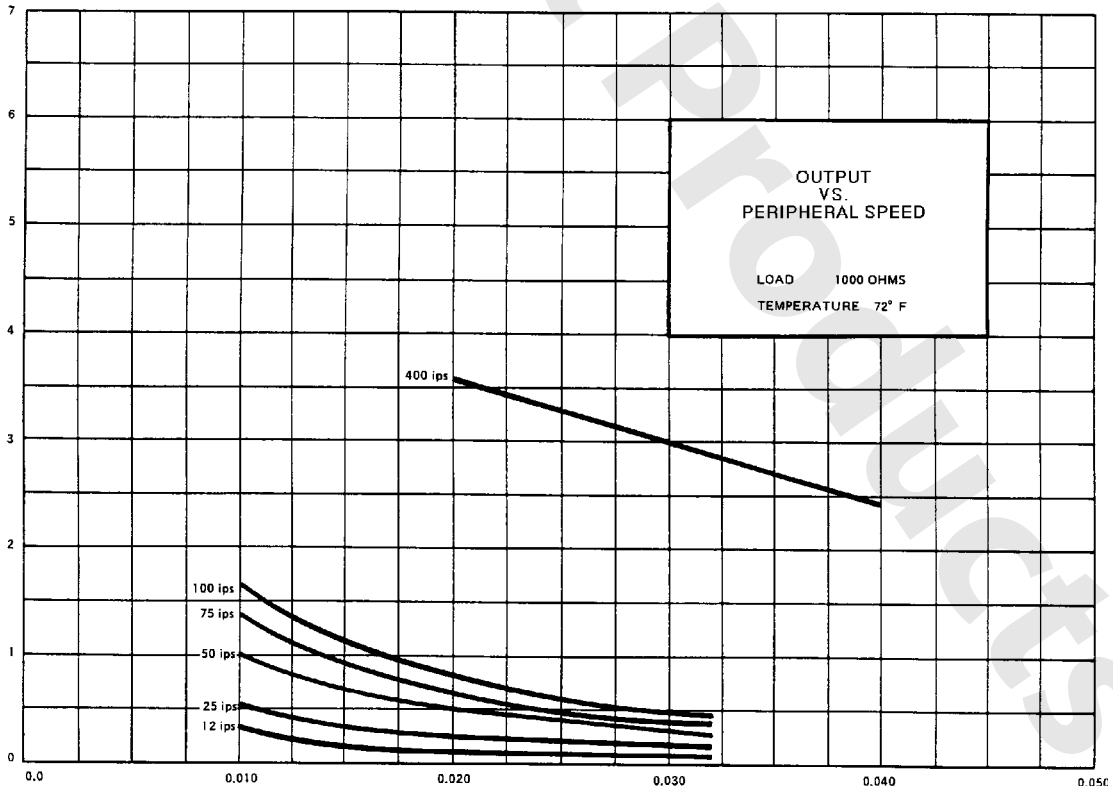
GRAPH 1



670A

Output Vs. Gap Distance.

GRAPH 2



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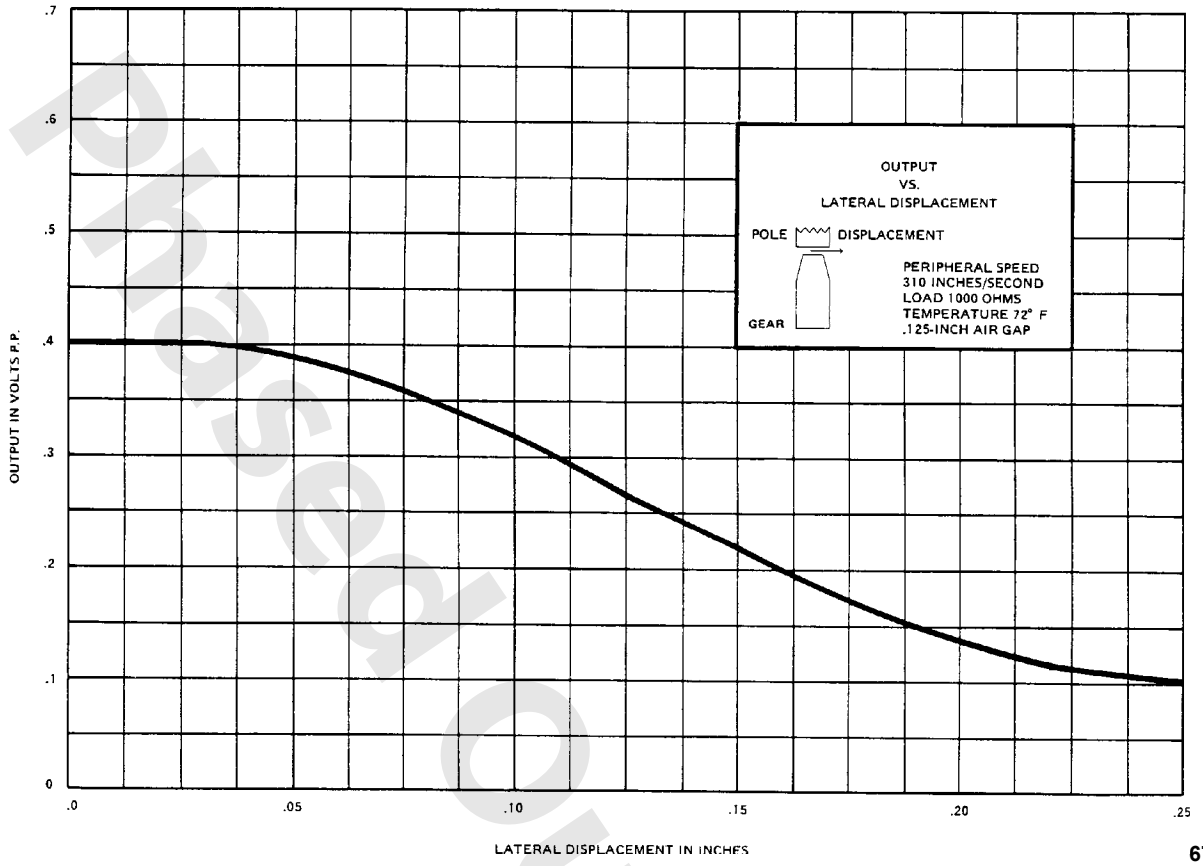
Output Vs. Peripheral Speed.

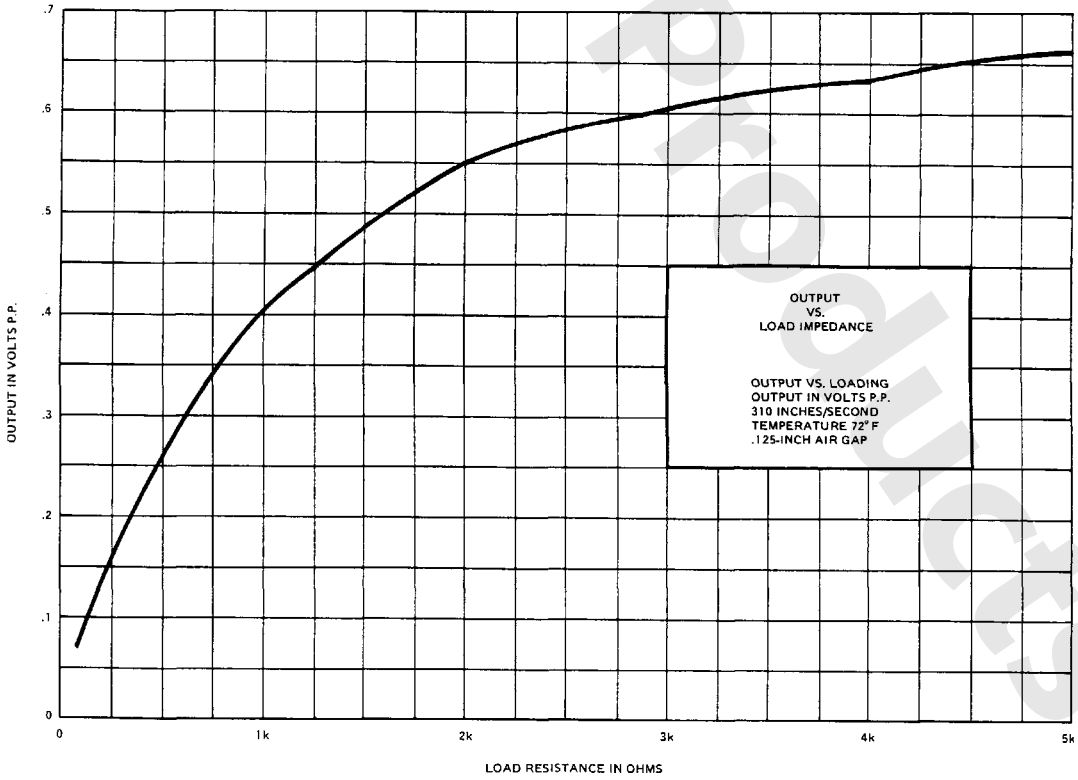
GRAPH 3



672A

Output Vs. Lateral Displacement.

GRAPH 4



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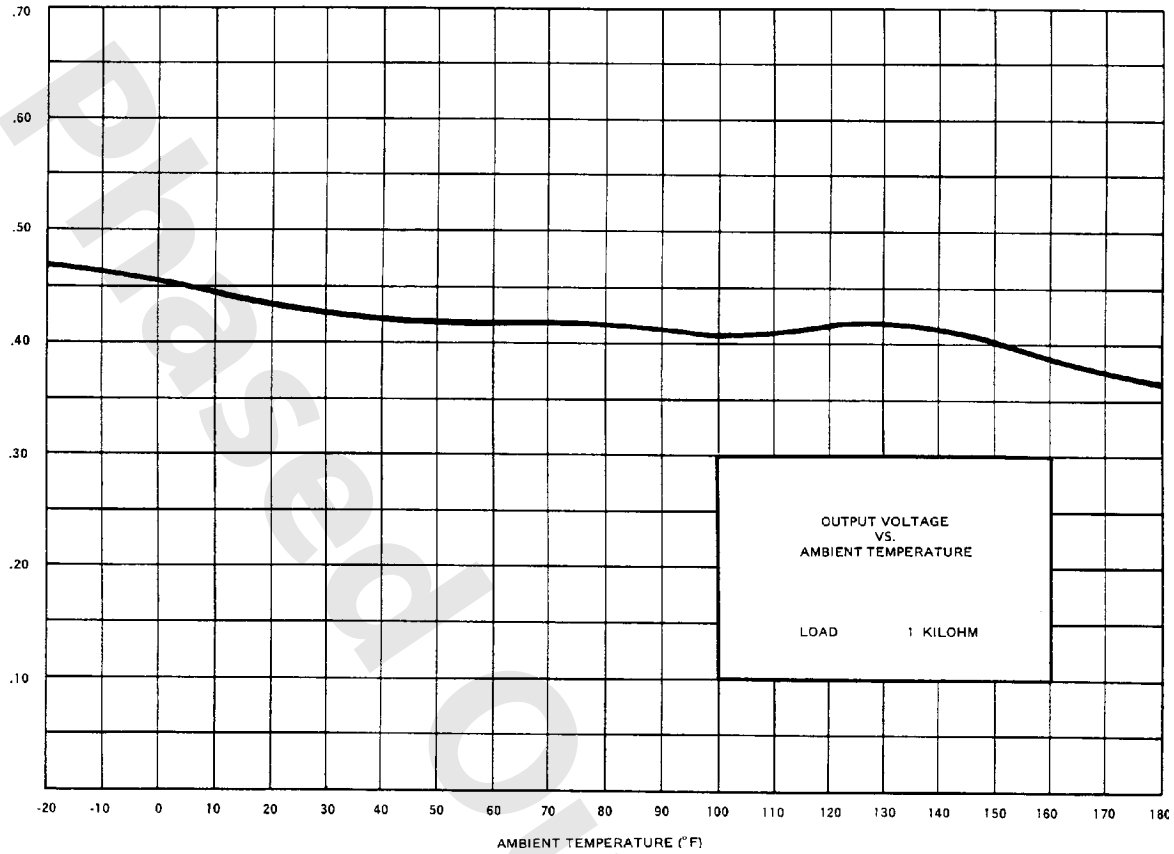
Output Vs. Load Impedance.

GRAPH 5



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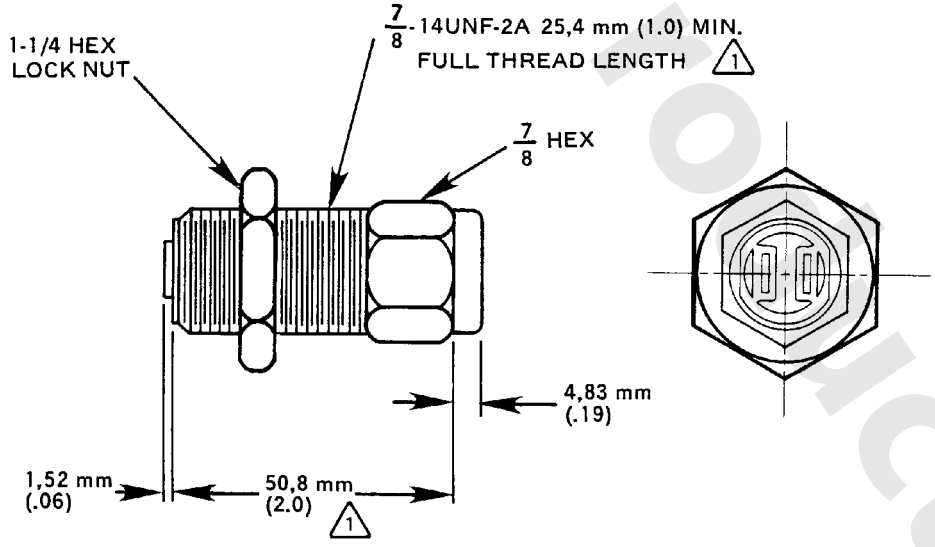
Output Voltage Vs. Ambient Temperature.

DIMENSIONS



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Dimensions of the SB100A in Millimeters (Inches).

THEORY OF OPERATION

Teeth of a magnetically permeable gear cut through magnetic flux lines generated by the SB100A, inducing voltage in the coil of the SB100A Magnetic Pulse Pickup. The voltage generated is directly proportional to the relative velocity of the gear, and is inversely proportional to the square of the gap between the fear tooth and the pole face of the SB100A. Voltage also depends upon size of the gear tooth and the load impedance connected to the SB100A.

The SB100A Magnetic Pulse Pickup emits a sinusoidal waveform from a rotating fine tooth gear. A course gear, or an isolated magnetic pickup such as a setscrew, develop steep pulse forms. Illustrations are given in the Waveform Output Variance drawing.

ENVIRONMENTAL

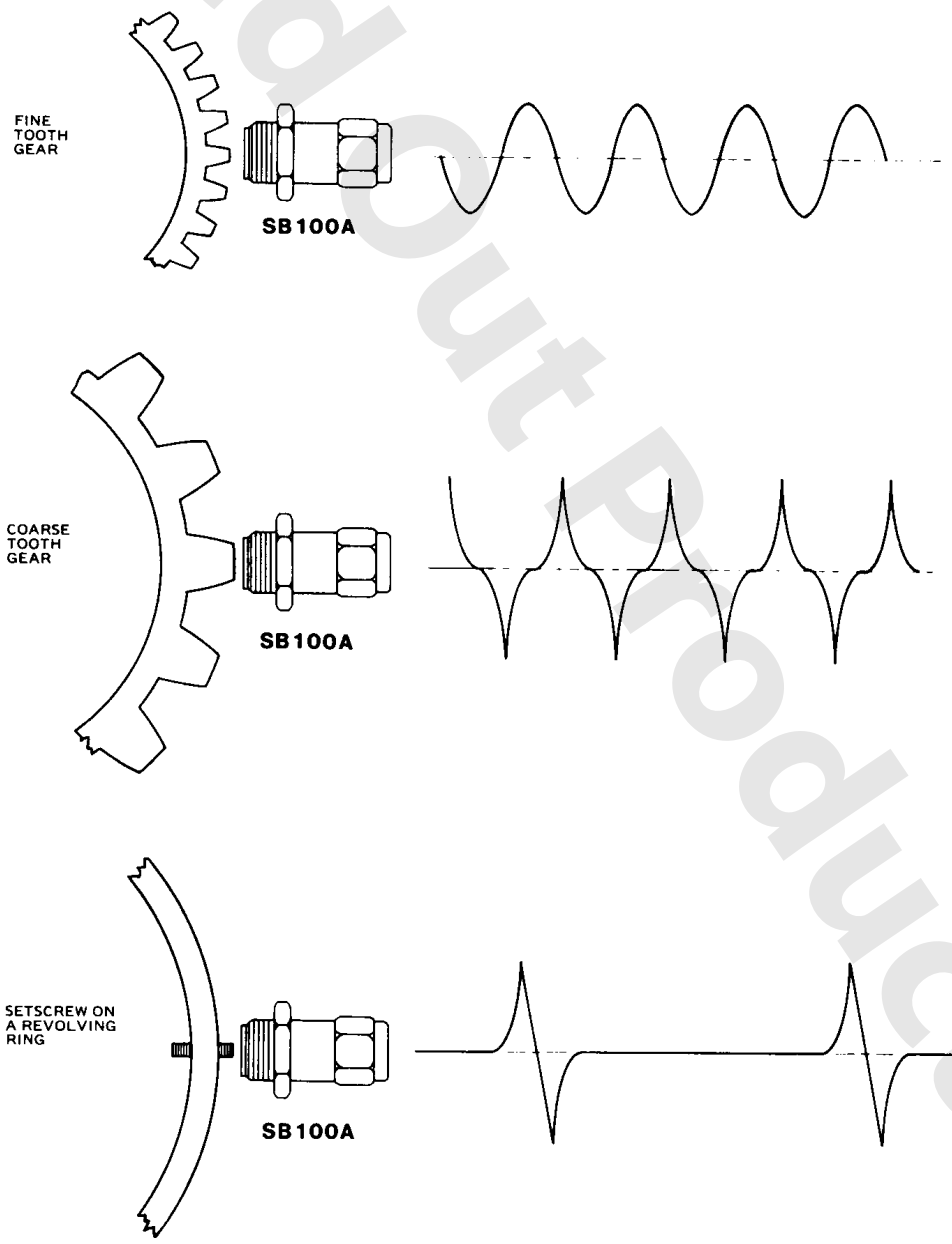
OPERATING AND STORAGE TEMPERATURE
-34° to +77° C (-30° to +170° F)

POLARITY
Terminal stamped + is positive lead as permeable material moves toward pole face.

WEIGHT
91 grams (3.4 ounces)

DIMENSIONS
See the Dimension drawing.

WAVEFORM OUTPUT VARIANCE



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Examples of Waveform Output Variance.

INSTALLATION

SELECT THE GEAR

When selecting the gear to monitor, some important facts must be kept in mind. Peripheral speed, size of the gear tooth (must be ferrous material), the number of gear teeth, and gap between the gear tooth and pole face of the SB100A affect the voltage output.

Graph I will help to determine peak-to-peak voltage at selected gap distances between the gear teeth and pole face. Peak-to-peak voltage can be adjusted by changing the gap distance so peripheral speed need only be close to the desired value of Graph I. Determine peripheral speed in inches per second by multiplying the diameter of the gear times π times the revolutions per minute divided by 60, i.e.,

$$ips = \frac{\pi (D) (RPM)}{60}$$

The Waveform Output Variance drawing shows the effect of gear tooth size on the voltage waveform. The nominal gear pitch for the SB100A is eight. Eight is the nominal value since, at that pitch, the tooth size of a flat tooth gear approximates the diameter of the pole face of the SB100A.

The number of gear teeth and the revolutions per second determine the frequency of the voltage. Simply multiply the number of teeth by the revolutions per minute divided by 60 to obtain the frequency in cycles per second, i.e., pps (pulses per second) = $\frac{(N) (RPM)}{60}$

EXAMPLE: A minimum peripheral speed of 15 inches per second at .020-inch air gap is a typical requirement for operation of an MCE100 PID Controller from an eight pitch spur gear. The MCE100 requires 0.2 Volts peak-to-peak minimum.

An eight pitch spur gear with an eight-inch diameter (64 teeth) operating at 1000 RPM (16.6 RPS) would provide 1060 pulses per second signal for full scale. At full speed, peripheral speed is 418 inches per second. Therefore, the minimum 15 inches per second peripheral speed (.020-inch air gap) would occur at 36 RPM. Below that speed, operation would be marginal.

The peak-to-peak voltage is inversely proportional to the square of the gap between the gear tooth and the pole face of the SB100A. Graph II illustrates voltage in relation to the gap distance.

Ideally, the pickup gear should have flat ends on the teeth (similar to a spur gear). If a chain sprocket is used, it can be turned down to give flat end exposure to the SB100A pole face, and will run more true so a narrow air gap is effective.

MOUNTING

Find a suitable mounting location, and supply a bracket with a 7/8-14 UNF threaded hole. Turn the SB100A into the bracket, and use Graph II as a guide for adjusting gap. Adjust the gap for the required input voltage of the Amplifier or Speed Controller. Tighten the locknut (Part Number K04072).

After the system is started, the gap can be further adjusted by loosening the locknut and turning the SB100A clockwise or counterclockwise to obtain optimum performance. If the Speed Control or Amplifier does not operate after the system is started, decrease the gap dimension until the system operates satisfactorily. Be sure power to the system is on, and the air gap is not made so small that the SB100A Pulse Pickup is struck by the gear.

WIRING

Wire the SB100A as specified in the installation instructions packed with the Amplifier or Speed Controller. “POS” is stamped on one of the hex flats of the SB100A (see the View of Positive Terminal). Metal moving into the magnetic field produces a positive voltage on the terminal adjacent to the hex flat marked “POS”.

VIEW OF POSITIVE TERMINAL

1205

View of SB100A Showing Identification of Positive Terminal.

TROUBLESHOOTING

Under normal use the SB100A Magnetic Pulse Pickup will give years of trouble-free, maintenance-free operation. If a problem exists, check the output with an RMS meter. A reading will indicate that pulses exist.

If the problem continues, the SB100A can be accurately checked with a scope.

A defective SB100A Magnetic Pulse Pickup cannot be repaired. Order a replacement.

CUSTOMER SERVICE

NORTH AMERICA

ORDER FROM

Danfoss (US) Company
Customer Service Department
3500 Annapolis Lane North
Minneapolis, Minnesota 55447
Phone: (763) 509-2084
Fax: (763) 559-0108

DEVICE REPAIR

For devices in need of repair, include a description of the problem, a copy of the purchase order and your name, address and telephone number.

RETURN TO

Danfoss (US) Company
Return Goods Department
3500 Annapolis Lane North
Minneapolis, Minnesota 55447

EUROPE

ORDER FROM

Danfoss (Neumünster) GmbH & Company
Order Entry Department
Krokamp 35
Postfach 2460
D-24531 Neumünster
Germany
Phone: 49-4321-8710
Fax: 49-4321-871355