

MPU-A Series Hall Effect Geartooth Sensor Pick-up

Features

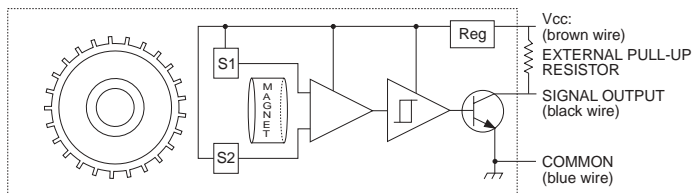
- Senses Motion of Ferrous Target
- Zero Speed Sensing Capabilities
- Digital Output Signal
- Large Operational Air Gap
- Wide Operating Temperature Range
- No Additional Conditioning Electronics Needed
- Immune to Hostile Environments
- Operates from 4.5 to 24 volts DC Supply
- Not subject to rotational orientation

The MPU-A Series geartooth speed sensor provides zero speed sensing capabilities using solid state Hall Effect technology. This ready-to-use pick-up directly senses rotating ferrous gear type targets such as web speed gears, power transmission gears, conveyor speed and other similar gear-based shaft encoders.

The MPU-A Series does not require a specially constructed target and is capable of sensing various target tooth sizes over wide ranges of airgap. The operational airgap achieved is independent of gear rotation speed. Internal temperature compensation allows this speed sensor to operate with minimal variation in performance over the specified temperature range.

The small module size makes it ideal in applications where space considerations are of concern. The rugged design allows the operation of these sensor assemblies in hostile environments where dirt and oil are major problems.

Functional Block Diagram



Functional Description

The MPU-A Series contains an integrated circuit Hall Effect sensor in conjunction with a permanent magnet which supplies a bias field. The Hall sensor is internally protected against reverse battery conditions and operates over a wide temperature and supply voltage range. This unique integrated solution makes it less susceptible to supply and ground noise interference.

The MPU-A Series requires no external electronics to further process the signal. The device is supplied with an open collector output capable of sinking 25mA and driving signals over wire lengths of up to 50 feet (15 meters).

Note that the MPU-A Geartooth Sensor is sensitive to exter-

nally applied magnetic fields greater than 500 gauss. Fields of this magnitude are unusual in most environments but are present in MPU-A's and other magnetic sensors. It is recommended that the user not allow these devices to come into direct contact with each other during installation.

Absolute Maximum Ratings

Power Supply, V_{CC}	24 V
Output OFF Voltage	24 V
Output ON Current, I_{SINK}	25 mA
Operating Temperature Range, T_A	-40° to +125°C
Storage Temperature Range, T_S	-40° to +125°C

The MPU-A Series is supplied in a rugged cylindrical threaded aluminum housing 15/32 inch in diameter and 1 inch barrel length. It is designed to operate in temperature environments ranging from -40°C to +125°C.

Pick-up Installation (Figure 1)

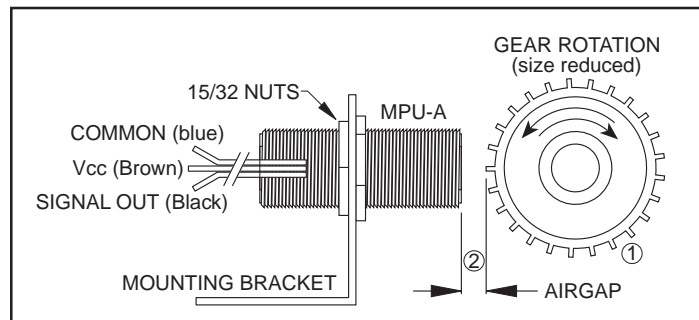


Figure 1

Gear Selection (Figure 2)

The MPU-A Series is designed to sense rotational speed of gears and gear-like targets. The optimal airgap performance is obtained using target materials with a high magnetic permeability such as low carbon steels.

Airgap vs. Target Pitch (typical and ± 2 sigma)

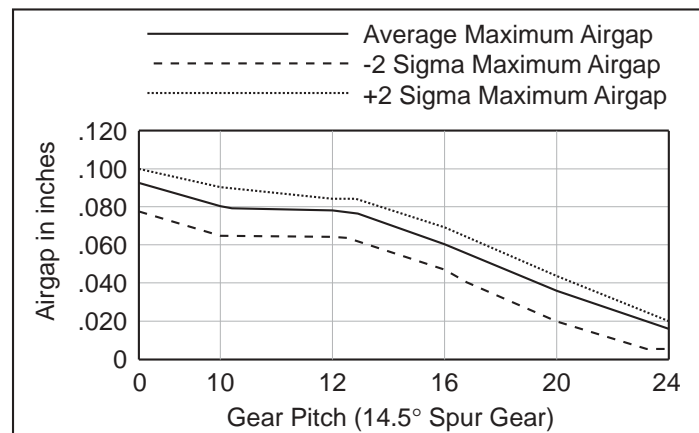


Figure 2

Performance Data (Figure 3)

The target described in Figure 3 was used in establishing fire point shift values on the accompanying Graph # 1 and Graph #2. The material used to construct the target was low carbon rolled steel 0.250" thick. The choice of dimensions for tooth width at 0.100" should be considered a practical minimum. The spacing between teeth and the depth of valleys can be adapted for specific requirements however performance of the sensor may be adversely affected. The minimum recommended dimensions are 0.1" at top of tooth, 0.1" between teeth and 0.15" tooth depth. These minimums will create sufficient magnetic flux change to actuate the sensor in all but the most extreme application at conditions. Non-repeating tooth patterns will provide timing and encoding capabilities for applications where more than speed sensing is desired. As a guideline, tooth dimensions approaching the minimum recommended will result in less working airgap, while larger teeth will result in a greater working airgap (see Figure #2).

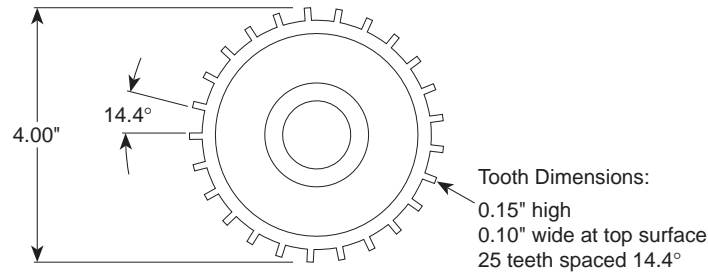


Figure 3

Electrical Hookup Instructions

The MPU-A Series pick-up is provided with an integral cable assembly.

Brown: V + (Battery Positive, 4.5 - 24 Volts DC)

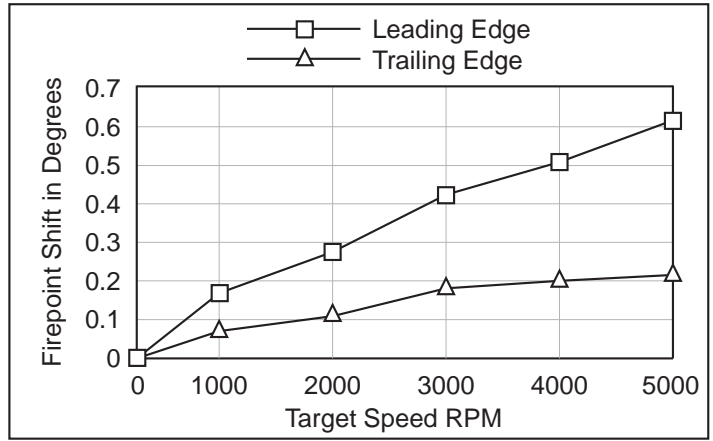
Blue: Common (Battery Negative)

Black: Signal Output

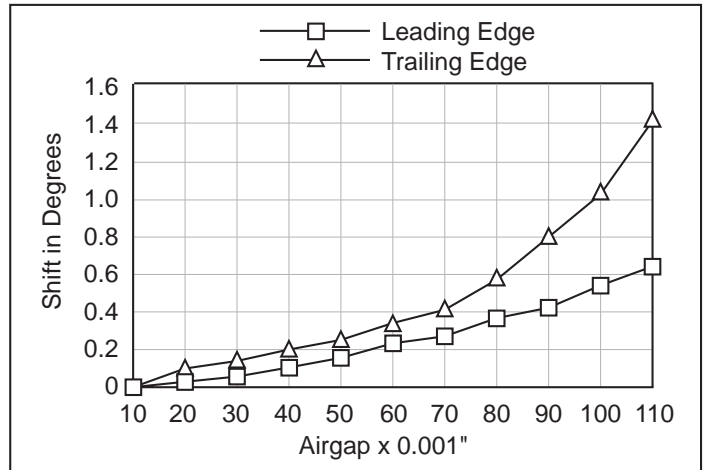
All Dart products requiring digital pulse feedback are designed with internal pull-up resistors. However, if the MPU-A is being used with a peripheral that does not have a pull-up resistor, then the resistor value can be determined by use of the following formula:

$$R = \frac{(V_{CC} - .2)}{I_{SINK}}$$

where I_{SINK} is the desired sink current (typically 5 mA, maximum 20 mA). For 5 volt V_{CC} and a desired 5 mA sink current, a resistor value of 960Ω is calculated (1KΩ may be used).



Graph # 1



Graph # 2

Dimensions and Wiring Connections

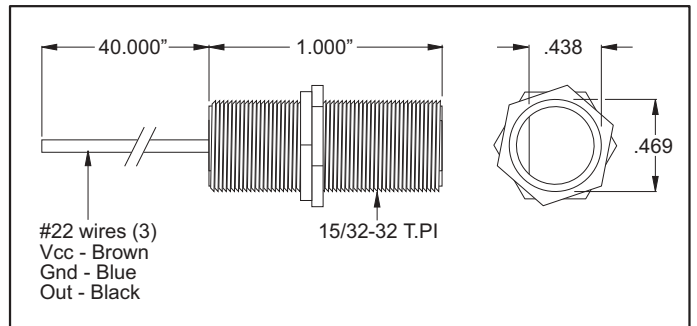


Figure 3