

## TRANSPORTATION AND INDUSTRIAL APPLICATIONS

## Application Note

### SMART Position Sensor, Rotary Configuration

#### SOLUTION

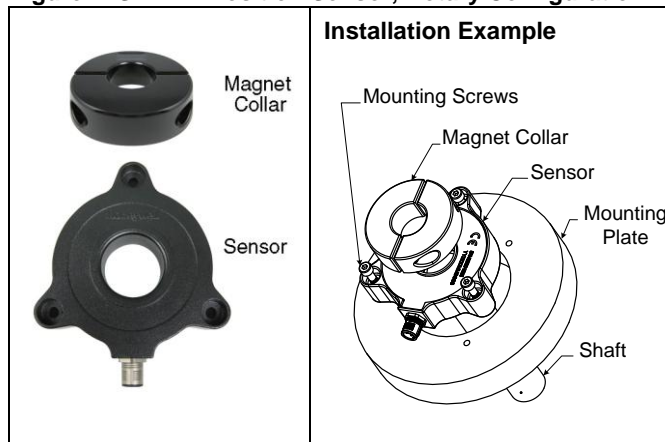
Honeywell's SMART Position Sensors are some of the most durable, adaptable, and lightweight absolute position sensors available in the industry, enabling highly accurate motion control and improving operation efficiency and safety.

The SMART Position Sensor, rotary configuration, is a non-contacting sensing solution for absolute position sensing with enhanced accuracy. It senses the position of a magnet relative to the sensor in a range of 0° to 360°. (See Figure 1.)

Honeywell uses a patented combination of an ASIC and an array of MR sensors to accurately and reliably determine the position of a magnet collar attached to a rotating object so that the object's position can be determined or controlled. The output and the MR sensor sequence determine the nearest pair of MR sensors to the center of the magnet location. The output of these two MR sensors is then used to determine the position of the magnet between them.

The SMART Position Sensor, rotary configuration, fits on a 25,4 mm [1 in] shaft. A mounting tool fixture (purchased separately) provides repeatable installation.

**Figure 1. SMART Position Sensor, Rotary Configuration**



#### VALUE PROPOSITIONS (★ = competitive differentiator)

- ★ **Non-contact design:** Eliminates mechanical failure mechanisms, reducing wear, which improves reliability and durability, and minimizes downtime

- ★ **Combined patented MR sensor and ASIC technology provides absolute position sensing:**
  - Helps OEMs reduce warranty costs because they don't have to replace worn or broken component parts
  - Helps end-users reduce downtime due to fewer calibration requirements
- ★ **No internal moving parts:** Automotive-grade potting makes the sensor more resistant to vibration, shock, and extreme temperatures, improving reliability
- ★ **Repeatable output:** Occurs within a 3,0 mm ±2,0 mm [0.118 in ±0.079 in] air gap between the sensor and magnet collar, expanding application opportunities
- **High accuracy:** Measures values down to 0.01°; better sensor accuracy can provide better system accuracy in the application
- ★ **IP67 and IP69K sealing:** Allows for use in harsh environments such as dust, immersion up to 1 m [39.37 in] of water for 30 minutes, and high pressure water sprays
- ★ **High shock and vibration resistance:** Allows for use in a wide variety of tough applications

#### FEATURES AND BENEFITS

- **Minimal signal error:** Exists up to 2,50 mm [0.10 in] of radial error, simplifying design-in
- **RoHS-compliant:** Materials meet Directive 2002/95/EC

Figures 2 through 7 show a variety of potential applications where the SMART Position Sensor, Rotary Configuration may be used.

#### TRANSPORTATION

##### Steering Angle (See Figure 2.)

A tractor or vehicle is steered in order to direct the vehicle's motion. The operator will usually turn a steering wheel in the cab which turns linkages, gear sets, or other components to direct the motion of the vehicle in a rotational direction.

Honeywell's SMART Position Sensor, Rotary Configuration, may be used to sense the angle of direction of the vehicle from the center pivot point or other appropriate location. This collected data may be used for automation purposes, initial testing, and validation purposes.

# SMART Position Sensor, Rotary Configuration

## Customer Benefits

- **Reduces position errors:** The sensor's accurate position sensing helps the operator better understand the yaw position of the vehicle, which may be useful for automation, diagnostic, or testing purposes
- **Withstands harsh worksite conditions:** IP67, 69k rating, EMC (electromagnetic compatibility) testing that protects the device from environmental radio frequencies, and the M12 connector helps protect the device from harsh worksite conditions
- **Extended product life:** Non-contact magneto-resistive technology reduces contact failures, eliminating mechanical failure mechanisms, reducing wear, improving reliability and durability, and reducing warranty replacements and machinery downtime
- **Saves time:** As the sensor's zero point is set at the factory (absolute position), the operator doesn't have to calibrate zero position each time the vehicle starts up, allowing for an immediate start to the job and easier integration by the OEM
- **Wide operating temperature range:** The device's operating temperature range of -40 °C to 85 °C [-40 °F to 185 °F] spans typical outdoor conditions, helping to provide reliable, repeatable output in cold winters and hot summers

Figure 2. Steering Angle



## Articulation Angle (See Figure 3.)

An articulation joint on equipment allows for motion of a trailer or attachment on a pivot point. This articulation joint allows for greater maneuverability, attachment options, and potentially can compensate for uneven surfaces.

Honeywell's SMART Position Sensor, Rotary Configuration, may be used to sense the angle of the articulation point. This collected data may be used for automation purposes, initial testing, and validation purposes.

Figure 3. Articulation Angle



## Customer Benefits

- **Reduces position errors:** The sensor's accurate position sensing helps the operator better understand the yaw position of the trailer or attachment, which may be useful for automation, diagnostic/limiting motion, or testing purposes
- **Withstands harsh worksite conditions:** IP67, 69k rating, EMC (electromagnetic compatibility) testing that protects the device from environmental radio frequencies, and the M12 connector helps protect the device from harsh worksite conditions
- **Extended product life:** Non-contact magneto-resistive technology reduces contact failures, eliminating mechanical failure mechanisms, reducing wear, improving reliability and durability, and reducing warranty replacements and machinery downtime
- **Saves time:** As the sensor's zero point is set at the factory (absolute position), the operator doesn't have to set zero position each time the vehicle control module starts up, allowing for an immediate ability to receive data from the sensor and easier integration into the system by the OEM
- **Wide operating temperature range:** The device's operating temperature range of -40 °C to 85 °C [-40 °F to 185 °F] spans typical outdoor conditions, helping to provide reliable, repeatable output in cold winters and hot summers

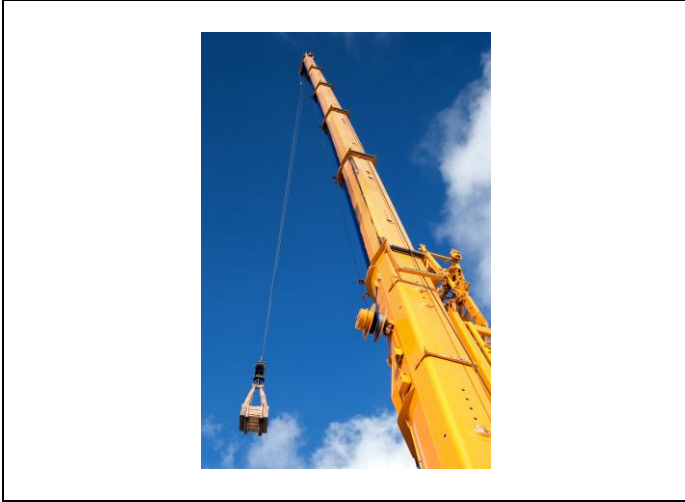
## Boom Arm Detection (See Figure 4.)

Equipment operators use boom arms to load and unload freight. Boom arms lift and lower materials and move them horizontally to other places.

Honeywell's SMART Position Sensor, Rotary Configuration, may be used to report the angular position of the boom arm relative to the operator located in the central control unit of the crane.

# SMART Position Sensor, Rotary Configuration

Figure 4. Boom Arm Detection



## Customer Benefits

- **Reduces position errors:** The sensor's accurate position sensing helps the operator better understand the position of the boom arm bucket, reducing bucket position error that is often magnified by the length of the torque arm
- **Withstands harsh worksite conditions:** IP67, 69k rating, EMC (electromagnetic compatibility) testing that protects the device from environmental radio frequencies, and M12 connector help protect the device from harsh worksite conditions
- **Extended product life:** Non-contact magnetostrictive technology reduces contact failures, eliminating mechanical failure mechanisms, reducing wear, improving reliability and durability, and reducing warranty replacements and machinery downtime
- **Saves time:** As the sensor's zero point is set at the factory, the operator doesn't have to calibrate zero position each day at the worksite, allowing for an immediate start to the job

## INDUSTRIAL

### Solar Panels (See Figure 5.)

A solar panel is a device that converts light—usually from the sun—into electricity. A solar panel is made up of many solar cells that convert the energy of light into electricity. The more light that hits a cell, the more electricity it produces

Figure 5. Solar Panel



## Customer Benefits:

- **Maximizes solar positioning:** Accurate positioning of the solar panel allows for direct alignment with the sun in order to maximize radiation over the course of the day
- **Withstands harsh outdoor conditions:** IP67, 69k ratings help protect the sensor from outdoor weather conditions
- **Extended product life:** Non-contact magnetostrictive technology reduces contact failures, eliminating mechanical failure mechanisms, reducing wear, improving reliability and durability, and reducing warranty replacements and machinery downtime
- **Wide operating temperature range:** The device's operating temperature range of -40 °C to 85 °C [-40 °F to 185 °F] spans typical outdoor conditions, helping to provide reliable, repeatable output in cold winters and hot summers

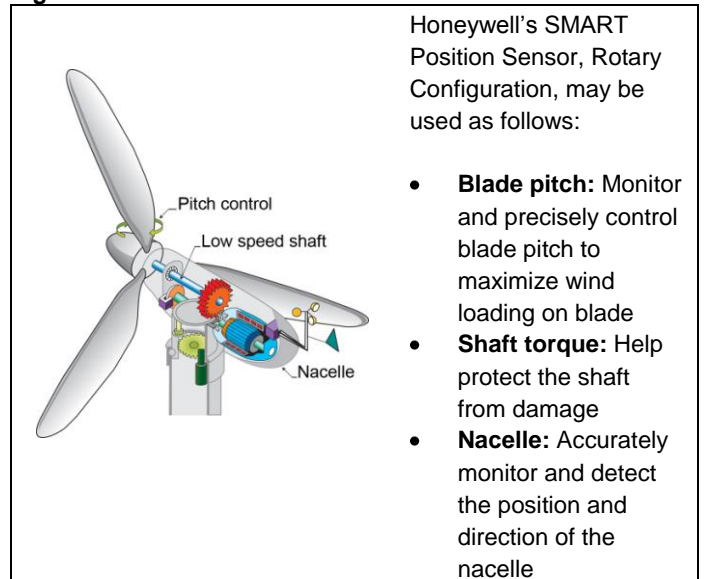
## Wind Turbines (See Figures 6 and 7)

Wind turbines use blades that are pitched or turned into and out of strong winds to avoid the rotor from turning too quickly in strong winds and to extract the maximum energy from low winds.

Figure 6. Wind Turbine Farm



Figure 7. Wind Turbine



Honeywell's SMART Position Sensor, Rotary Configuration, may be used as follows:

- **Blade pitch:** Monitor and precisely control blade pitch to maximize wind loading on blade
- **Shaft torque:** Help protect the shaft from damage
- **Nacelle:** Accurately monitor and detect the position and direction of the nacelle

# SMART Position Sensor, Rotary Configuration

## Customer Benefits

- **Energy efficient:** Accurate position sensing maximizes energy efficiency by utilizing correct blade placement
- **Saves time:** Absolute position helps reduce operator maintenance and calibration efforts
- **Withstands harsh outdoor conditions:** IP67, 69k ratings help protect the sensor from dusty, wintry, outdoor conditions

## WARNING

### PERSONAL INJURY

- DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

**Failure to comply with these instructions could result in death or serious injury.**

## WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

- **Wide operating temperature range:** The device's operating temperature range of -40 °C to 85 °C [-40 °F to 185 °F] spans typical outdoor conditions, helping to provide reliable, repeatable output in cold winters and hot summers
- **Extended product life:** Non-contact magnetoresistive technology reduces the likelihood of damage caused by snow or ice interfering with sensor's motion operation

## WARNING

### MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

**Failure to comply with these instructions could result in death or serious injury.**

## SALES AND SERVICE

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

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