

EXCAVATOR BUCKET POSITION SENSING

Application Note

Honeywell SMART Arc CAN sensor is designed for heavy-duty, off-highway vehicles like excavators and backhoes to enable the direct measurement of bucket movements.

BACKGROUND

In this modern era of automation, earth moving firms are turning to operator assist technology to allow their operators to work efficiently. Operator assist technology allows the automation of frequent job site operations such as dig, load, dump and grade. These automated operations are guided by software that is able to precisely control bucket movements to dig where needed and grade at preset angles.

Today, in-cylinder position sensors are used in construction vehicles like excavators and wheel loaders, to determine the position of the bucket. In-cylinder position sensors are known to have poor reliability, be expensive to replace and require an in-direct measurement approach for bucket position, causing tolerance and accuracy stack up error.

Honeywell is introducing the SMART Arc CAN as a replacement for in-cylinder position sensors.

SMART ARC CAN

Honeywell's SMART Arc CAN Position sensor with CAN-J1939 protocol is specifically designed for demanding applications in industries such as heavy-duty off-highway transportation. The SMART Arc CAN enhances efficiency and productivity by reporting key data required to monitor and automate bucket movements.

OEMs can use this feedback to help predict the exact location of the bucket. The sensor is mounted on the stick; the magnet is attached directly to the idler link from the bucket to the stick. As the idler link rotates in conjunction with the bucket, a magnet attached to the idler link also rotates – allowing for accurate position sensing. OEMs can use these precise bucket position sensing capability to add features to their equipment, including operator assist or full automation control.



SPS

SMART Arc CAN Enabled 145° Position Sensor

Non-contact design reduces wear and tear, improving reliability and durability, minimizing downtime

Measure the full 145° range with a linearity of 0.3%

Lighter in weight than optical encoders

Sensor Output:
CAN-2.0B SAE J1939

IP68, IP69K sealing

Honeywell



EXCAVATORS

One of the most versatile and heavily utilized earth is the excavator. The excavator is truly a workhorse for its owner. Available in many different sizes with many features, the excavator makes quick work of any digging, trenching, grading, loading and other types of work. Typically equipped with a large bucket for digging, these machines can be easily changed over to utilize other implements, such as claws for grabbing, rock crushers, even cutters. The list is endless.

Proper operation of such a machine requires great skill to ensure safety and efficiency. Training operators to be proficient in operating these complex machines can take many months.

Honeywell's new line of SMART products are designed to improve the efficiency of the operator.



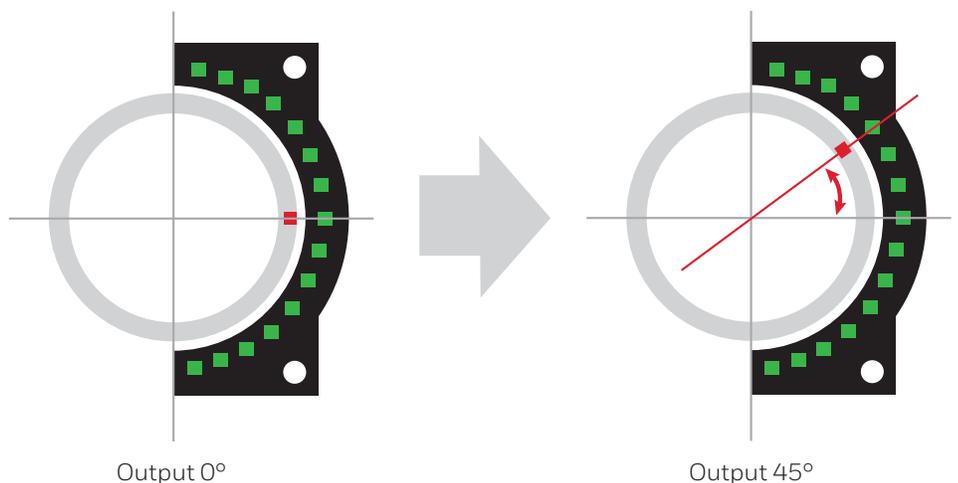
SOLUTION

SMART Arc sensors provides precise position feedback of the bucket. This can be combined with other sensing solutions to provide either operator assist capability or full autonomy of the machine.

Honeywell SMART Arc CAN Sensor Technology Overview

- Bucket sensor is a two-piece design, consisting of the sensor and the magnet ring carrier
- Theory of operation: as the magnet moves with respect to the sensor body, the position of the bucket can be measured

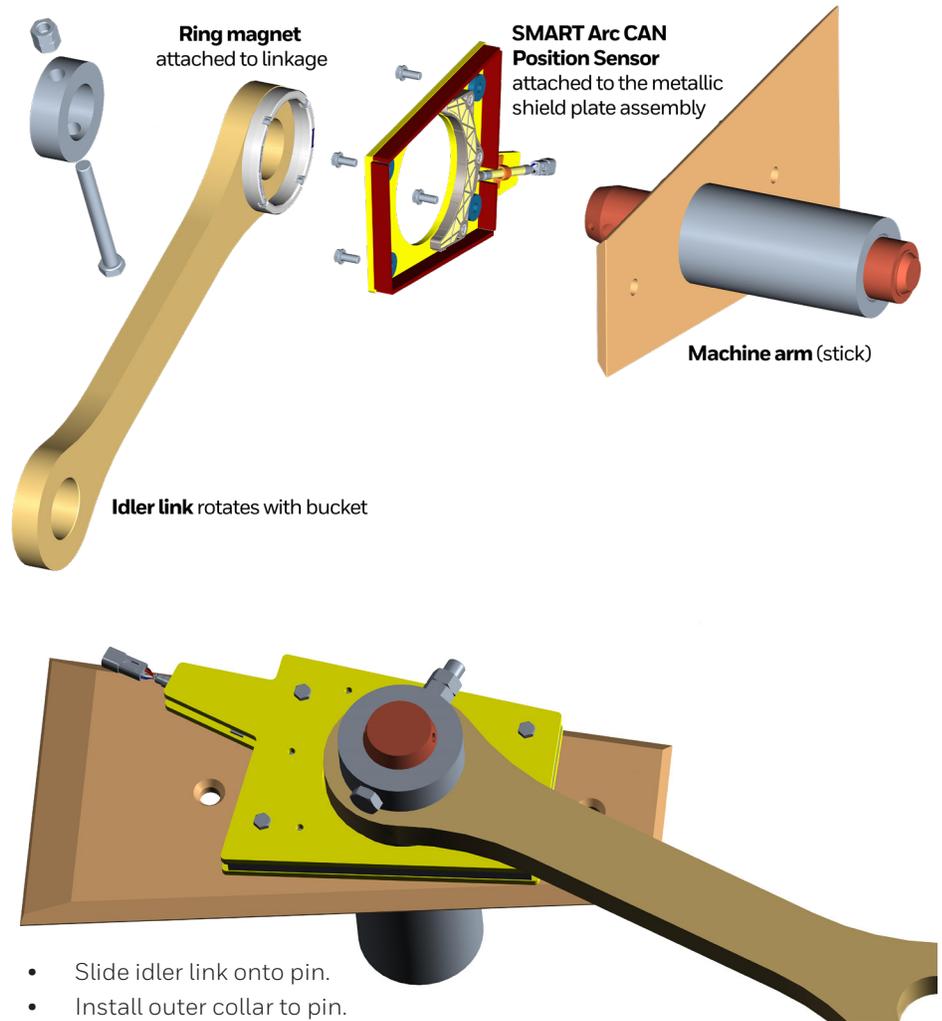
Operating Principles Example





TYPICAL INSTALLATION EXAMPLE

The SMART Arc CAN Position Sensor is mounted on the stick, and the magnetic ring is attached directly to the idler link. As the Idler link rotates in conjunction with the bucket, the magnetic ring rotates with respect to sensor allowing for accurate position detection. The sensor is attached to the metallic shield plate that protects it from external stone and debris.



- Slide idler link onto pin.
- Install outer collar to pin.
- Fasten outer collar nut & bolt to lock idler link in place.



SMART ARC CAN POSITION SENSOR

The Honeywell SMART Arc CAN Position Sensor is a durable, adaptable, lightweight, and non-contact position sensor. It enables absolute position sensing with enhanced accuracy. This simple, robust, arc position sensor offers an IP69K sealed package, eliminating mechanical failure, reducing wear and tear, improving reliability and durability and minimizing downtime.

The SMART Arc CAN Position Sensor is a non-contact sensing solution, providing highly accurate motion control along with improving operation efficiency and safety. This Honeywell position sensor utilizes magnetoresistive technology to detect the position of a magnet relative to the sensor in one of two available sizes, within a range of: 0° to 145°.

Three active configurations to choose from:

1. SPS-A145D-WCBS0301, (Sensor-161), baud rate of 250 KB, defined by the 161 mm outer magnet ring diameter
2. SPS-A145D-WCBS0302, (Sensor-161), baud rate of 500 KB, defined by the 161 mm outer magnet ring diameter
3. SPS-A145D-WCBS0303, (Sensor-220), baud rate of 250 KB, defined by the 220 mm outer magnet ring diameter

VALUE TO CUSTOMER

Reliable, durable: Non-contact design reduces wear and tear, improving reliability and durability, minimizing downtime

Rugged: Honeywell utilizes unique package materials with no moving parts within the sensor, making it resistant to vibration, shock, and extreme temperatures

Flexible: Air gap tolerance of 5,25 mm between sensor and magnet expands application use

Cost effective: Adaptable, non-contacting design allows customers to eliminate unnecessary connections for installation, reducing installation steps/time and components

Accurate: Measure the full 145° range with a linearity of 0.3%

Adaptable: Electronics on board allow for flexible packaging and component compatibility with existing systems

Lightweight: Lighter in weight than optical encoders

Self-diagnostics feature can reduce equipment downtime by providing predictive maintenance input

Combined patented MR sensor and ASIC technology provide enhanced differentiation and performance

IP68, IP69K sealing allow use in many harsh applications

RoHS-compliant materials meet Directive 2002/95/EC

Connector: **Deutsch DT06-04**

Sensor Output: **CAN-J1939 protocol**

SENSOR RING MAGNET CARRIERS

Honeywell offers two different size Magnet Carriers; they are specific for the two different sensor diameters.

Ring Options

1. SPS-A145D-WCBS0301 and SPS-A145D-WCBS0302 will require the **SPSMAG-017 for (Sensor 161)**
2. SPS-A145D-WCBS0303 (Sensor-220) will require **SPS-MAG-018**

Rings are marked with the Honeywell part number, before installation customer should ensure the proper ring magnet has been supplied.



FOR MORE INFORMATION

Honeywell Advanced Sensing Technologies services its customers through a worldwide network of sales offices and distributors. For application assistance, current specifications, pricing, or the nearest Authorized Distributor, visit sps.honeywell.com/ast or call:

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