SMART ARC

000732
Issue 4

SMART Position Sensor, 100° and 180° Arc Configurations

Superior Measurement. Accurate. Reliable. Thinking.



DESCRIPTION

The Honeywell SMART Arc Position Sensor is one of the most durable, adaptable, lightweight, and non-contact position sensors available, enabling absolute position sensing with enhanced accuracy. This simple, robust, arc position sensor offers an IP69K sealed package, eliminating mechanical failure mechanisms, reducing wear and tear, improving reliability and durability, and minimizing downtime.

The SMART Arc Position Sensor is a non-contact sensing solution, providing highly accurate motion control and 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 sensing ranges: 0° to 100°, 0° to 180°.

Why is the SMART Position Sensor smart? SMART means that this is a sensor that can essentially think for itself. SMART Position Sensors provide a self-diagnostics feature and data gathering for enhanced reliability and closed-loop feedback control.

These devices use a patented combination of an ASIC (Application-Specific Integrated Circuit) and an array of MR (magnetoresistive) sensors to accurately and reliably determine the position of a magnet attached to a moving object so that the object's position can be determined or controlled.

The MR array measures the output of the MR sensors mounted along the magnet's direction of travel. 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.

With this sensor, Honeywell has utilized MR technology through the ASIC at a level never before accomplished.

POTENTIAL APPLICATIONS

Transportation

- Aerial work lift platform, front end loader and digger/excavator boom position
- Scissor lift position
- Refuse truck lift and automatic reach arm position
- Mobile crane steering
- Timber harvester/processor equipment cutter arm angle
- On-board loader weighing system position

Industrial

- Telescoping conveyor elevation
- Power generation contact angle
- Rail-road crossing arms position

Military

- Remote weapon systems elevation
- Chassis suspension systems position height
- Military vehicle door position

Aerospace:

- Ground-based solar panels elevation and azimuth
- Ground-based satellite dish elevation and azimuth

Medical:

- Robotically-assisted surgery equipment position
- Patient bed elevation

FEATURES

- **Reliable, durable:** Non-contact design reduces wear and tear, minimizing downtime
- **Easy to install:** Installation takes four steps (1: position device; 2: drill holes; 3: mount sensor; 4: locate magnet/ connect sensor) vs. up to 14 steps some competitive products require
- **Rugged:** Utilizes unique package materials with no moving parts within the sensor, making it resistant to vibration, shock, and extreme temps
- **Flexible:** Air gap tolerance of 7,8 mm ±2,5 mm [0.307 in ±0.098 in] or 9,2 mm ±2,5 mm [0.36 in ±0.09 in] (100°) and 8,5 mm ±2,5 mm [0.338 in ±0.098 in] (180°) 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:** 100° configuration accurately measures values down to 0.06° while the 180° configuration accurately measures values down to 0.11°
- **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
- **IP67, IP69K sealing** allow use in many harsh applications
- **RoHS-compliant materials** meet Directive 2002/95/EC

Honeywell

SMART ARC 100° & 180°
POSITION SENSOR

TABLE 1. 100° SPECIFICATIONS (Analog: SPS-A100D-HAMS)

	Min.	Typ.	Max.	Units
Sensor Charactertistics				
Sensing range	0	–	100	Degree
Sensing location	Inside	–	–	
Supply voltage	6	–	24	Vdc
Supply current	–	–	45	mA
Output type	Regulated voltage			
Output at min. pos	–	0.5	–	Vdc*
Output at max. pos	–	4.5	–	Vdc*
Full scale span	–	4	–	Vdc
Sensitivity	38.4	40	41.6	mV/Degree
Linearity	±0.4 %			Full scale output
Resolution	0.06			Degree
Measurement frequency	–	312	–	Hz
Reverse polarity	-26.4			Vdc
Startup time	5			mS
Connector				
Termination	4-pin M12 connector			
Operating Environment				
Operating temperature	-40°C to 85°C [-40°F to 185°F]			
Storage temperature	-40°C to 150°C [-40°F to 302°F]			
Air gap	7,8 mm ±2,5 mm [0.307 in ±0.098 in]			
Ingress protection	IP67, IP69K			
Mechanical shock	50 G half sine wave with 11 ms duration			
Vibration	20 G from 10 Hz to 2000 Hz			
Certification				
Certification/approval	CE, UKCA			
Mounting				
Housing	Thermoplastic			
Mounting screws	1/4-20 or M6			
Mounting torque	6 Nm to 8 Nm [53.1 in-lb to 70.8 in-lb]			
Magnetic Actuator				
Material	Neodymium Iron Boron			
Field strength	10000			

Device used to read analog output must have input impedance greater than 100 KOhm.

Sensor is able to output two diagnostic values as follows: Magnet out of range - Output ≤95 % of power rail. PIN 2 > 4.55 & PIN 4 < 0.45

FERROUS MATERIAL WITHIN 100 mm (3.9 in) RADIUS OF MAGNET MAY IMPACT SENSOR PERFORMANCE

Output at Pin 2, Output at Pin 4 will be of negative slope, at min. position Vout will be 4.5 V and max. position Vout will be 0.5 V

SMART ARC 100° & 180°
POSITION SENSOR

TABLE 2. 100° SPECIFICATIONS (Analog: SPS-A100D-HAWS)

	Min.	Typ.	Max.	Units
Sensor Charactertistics				
Sensing range	0	–	100	Degree
Sensing location	Inside	–	–	
Supply voltage	6	–	24	Vdc
Supply current	–	–	45	mA
Output type	Regulated voltage			
Output at min. pos	–	0.5	–	Vdc*
Output at max. pos	–	4.5	–	Vdc*
Full scale span	–	4	–	Vdc
Sensitivity	38.4	40	41.6	mV/Degree
Linearity	±0.4 %			Full scale output
Resolution	0.06			Degree
Measurement frequency	–	312	–	Hz
Reverse polarity	-26.4			Vdc
Startup time	5			mS
Connector				
Termination	18 AWG flying leads			
Operating Environment				
Operating temperature	-40°C to 85°C [-40°F to 185°F]			
Storage temperature	-40°C to 150°C [-40°F to 302°F]			
Air gap	7,8 mm ±2,5 mm [0.307 in ±0.098 in]			
Ingress protection	IP67, IP69K			
Mechanical shock	50 G half sine wave with 11 ms duration			
Vibration	20 G from 10 Hz to 2000 Hz			
Certification				
Certification/approval	CE, UKCA			
Mounting				
Housing	Thermoplastic			
Mounting screws	1/4-20 or M6			
Mounting torque	6 Nm to 8 Nm [53.1 in-lb to 70.8 in-lb]			
Magnetic Actuator				
Material	Neodymium Iron Boron			
Field strength	10000			

Device used to read analog output must have input impedance greater than 100 KOhm.

Sensor is able to output two diagnostic values as follows: Magnet out of range - Output ≤95 % of power rail. PIN 2 > 4.55 & PIN 4 < 0.45

FERROUS MATERIAL WITHIN 100 mm (3.9 in) RADIUS OF MAGNET MAY IMPACT SENSOR PERFORMANCE

Output at Pin 2, Output at Pin 4 will be of negative slope, at min. position Vout will be 4.5 V and max. position Vout will be 0.5 V

SMART ARC 100° & 180°
POSITION SENSOR

TABLE 3. 100° SPECIFICATIONS (Analog: SPS-A100D-VAMS)

	Min.	Typ.	Max.	Units
Sensor Charactertistics				
Sensing range	0	–	100	Degree
Sensing location	Inside	–	–	
Supply voltage	18	–	40	Vdc
Supply current	–	–	45	mA
Output type	Regulated voltage			
Output at min. pos	–	0.5	–	Vdc*
Output at max. pos	–	4.5	–	Vdc*
Full scale span	–	4	–	Vdc
Sensitivity	38.4	40	41.6	mV/Degree
Linearity	±0.4 %			Full scale output
Resolution	0.06			Degree
Measurement frequency	–	312	–	Hz
Reverse polarity	-40			Vdc
Startup time	5			mS
Connector				
Termination	18 AWG flying leads			
Operating Environment				
Operating temperature	-40°C to 85°C [-40°F to 185°F]			
Storage temperature	-40°C to 150°C [-40°F to 302°F]			
Air gap	7,8 mm ±2,5 mm [0.307 in ±0.098 in]			
Ingress protection	IP67, IP69K			
Mechanical shock	50 G half sine wave with 11 ms duration			
Vibration	20 G from 10 Hz to 2000 Hz			
Certification				
Certification/approval	CE, UKCA			
Mounting				
Housing	Thermoplastic			
Mounting screws	1/4-20 or M6			
Mounting torque	6 Nm to 8 Nm [53.1 in-lb to 70.8 in-lb]			
Magnetic Actuator				
Material	Neodymium Iron Boron			
Field strength	10000			

Device used to read analog output must have input impedance greater than 100 KOhm.

Sensor is able to output two diagnostic values as follows: Magnet out of range - Output ≤95 % of power rail. PIN 2 > 4.55 & PIN 4 < 0.45

FERROUS MATERIAL WITHIN 100 mm (3.9 in) RADIUS OF MAGNET MAY IMPACT SENSOR PERFORMANCE

Output at Pin 2, Output at Pin 4 will be of negative slope, at min. position Vout will be 4.5 V and max. position Vout will be 0.5 V

SMART ARC 100° & 180°
POSITION SENSOR

TABLE 4. 100° SPECIFICATIONS (Analog: SPS-A100X-LAAS0401)

	Min.	Typ.	Max.	Units
Sensor Charactertistics				
Sensing range	0	–	100	Degree
Sensing location	Outside	–	–	
Supply voltage	–	5	–	Vdc
Supply current	–	–	30	mA
Output type	Regulated voltage			
Output at min. pos	–	0.5	–	Vdc*
Output at max. pos	–	4.5	–	Vdc*
Full scale span	–	4	–	Vdc
Sensitivity	38.4	40	41.6	mV/Degree
Linearity	±0.4 %			Full scale output
Resolution	0.06			Degree
Measurement frequency	–	312	–	Hz
Reverse polarity	N/A			Vdc
Startup time	5			mS
Connector				
Termination	Ampseal 16 connector (p/n 776536)			
Operating Environment				
Operating temperature	-40°C to 85°C [-40°F to 185°F]			
Storage temperature	-40°C to 150°C [-40°F to 302°F]			
Air gap	9,2 mm ±2,5 mm [0.36 in ±0.098 in]			
Ingress protection	IP67, IP69K			
Mechanical shock	50 G half sine wave with 11 ms duration			
Vibration	20 G from 10 Hz to 2000 Hz			
Certification				
Certification/approval	CE, UKCA			
Mounting				
Housing	Thermoplastic			
Mounting screws	1/4-20 or M6			
Mounting torque	6 Nm to 8 Nm [53.1 in-lb to 70.8 in-lb]			
Magnetic Actuator				
Material	Neodymium Iron Boron			
Field strength	10000			

Device used to read analog output must have input impedance greater than 100 KOhm.

Sensor is able to output two diagnostic values as follows: Magnet out of range - Output ≤95 % of power rail. PIN 2 > 4.55 & PIN 4 < 0.45

FERROUS MATERIAL WITHIN 100 mm (3.9 in) RADIUS OF MAGNET MAY IMPACT SENSOR PERFORMANCE

Output at Pin 2, Output at Pin 4 will be of negative slope, at min. position Vout will be 4.5 V and max. position Vout will be 0.5 V

SMART ARC 100° & 180°
POSITION SENSOR

TABLE 5. 180° SPECIFICATIONS (Analog: SPS-A180D-HAMS)

	Min.	Typ.	Max.	Units
Sensor Charactertistics				
Sensing range	0	–	180	Degree
Sensing location	Inside	–	–	
Supply voltage	6	–	24	Vdc
Supply current	–	–	45	mA
Output type	Regulated voltage			
Output at min. pos	–	0.5	–	Vdc*
Output at max. pos	–	4.5	–	Vdc*
Full scale span	–	4	–	Vdc
Sensitivity	21.33	22.22	23.11	mV/Degree
Linearity	±0.4 %			Full scale output
Resolution	0.11			Degree
Measurement frequency	–	312	–	Hz
Reverse polarity	-26.4			Vdc
Startup time	5			mS
Connector				
Termination	4-pin M12 connector			
Operating Environment				
Operating temperature	-40°C to 85°C [-40°F to 185°F]			
Storage temperature	-40°C to 150°C [-40°F to 302°F]			
Air gap	8,58 mm ±2,5 mm [0.338 in ±0.098 in]			
Ingress protection	IP67, IP69K			
Mechanical shock	50 G half sine wave with 11 ms duration			
Vibration	20 G from 10 Hz to 2000 Hz			
Certification				
Certification/approval	CE, UKCA			
Mounting				
Housing	Thermoplastic			
Mounting screws	1/4-20 or M6			
Mounting torque	6 Nm to 8 Nm [53.1 in-lb to 70.8 in-lb]			
Magnetic Actuator				
Material	Neodymium Iron Boron			
Field strength	10000			

Device used to read analog output must have input impedance greater than 100 KOhm.

Sensor is able to output two diagnostic values as follows: Magnet out of range - Output ≤95 % of power rail. PIN 2 > 4.55 & PIN 4 < 0.45

FERROUS MATERIAL WITHIN 100 mm (3.9 in) RADIUS OF MAGNET MAY IMPACT SENSOR PERFORMANCE

Output at Pin 2, Output at Pin 4 will be of negative slope, at min. position Vout will be 4.5 V and max. position Vout will be 0.5 V

SMART ARC 100° & 180°
POSITION SENSOR

TABLE 6. 180° SPECIFICATIONS (Analog: SPS-A180D-VAMS)

	Min.	Typ.	Max.	Units
Sensor Charactertistics				
Sensing range	0	–	180	Degree
Sensing location	Inside			
Supply voltage	18	–	40	Vdc
Supply current	–	–	45	mA
Output type	Regulated voltage			
Output at min. pos	–	0.5	–	Vdc*
Output at max. pos	–	4.5	–	Vdc*
Full scale span	–	4	–	Vdc
Sensitivity	21.33	22.22	23.11	mV/Degree
Linearity	±0.4 %			Full scale output
Resolution	0.11			Degree
Measurement frequency		312		Hz
Reverse polarity	-40			Vdc
Startup time	5			mS
Connector				
Termination	4-pin M12 connector			
Operating Environment				
Operating temperature	-40°C to 85°C [-40°F to 185°F]			
Storage temperature	-40°C to 150°C [-40°F to 302°F]			
Air gap	8,58 mm ±2,5 mm [0.338 in ±0.098 in]			
Ingress protection	IP67, IP69K			
Mechanical shock	50 G half sine wave with 11 ms duration			
Vibration	20 G from 10 Hz to 2000 Hz			
Certification				
Certification/approval	CE, UKCA			
Mounting				
Housing	Thermoplastic			
Mounting screws	1/4-20 or M6			
Mounting torque	6 Nm to 8 Nm [53.1 in-lb to 70.8 in-lb]			
Magnetic Actuator				
Material	Neodymium Iron Boron			
Field strength	10000			

Device used to read analog output must have input impedance greater than 100 KOhm.

Sensor is able to output two diagnostic values as follows: Magnet out of range - Output ≤95 % of power rail. PIN 2 > 4.55 & PIN 4 < 0.45

FERROUS MATERIAL WITHIN 100 mm (3.9 in) RADIUS OF MAGNET MAY IMPACT SENSOR PERFORMANCE

Output at Pin 2, Output at Pin 4 will be of negative slope, at min. position Vout will be 4.5 V and max. position Vout will be 0.5 V

Figure 1. Dimensional Drawings (For reference only: mm/[in].)

SPS-A100D-HAMS, SPS-A100D-VAMS

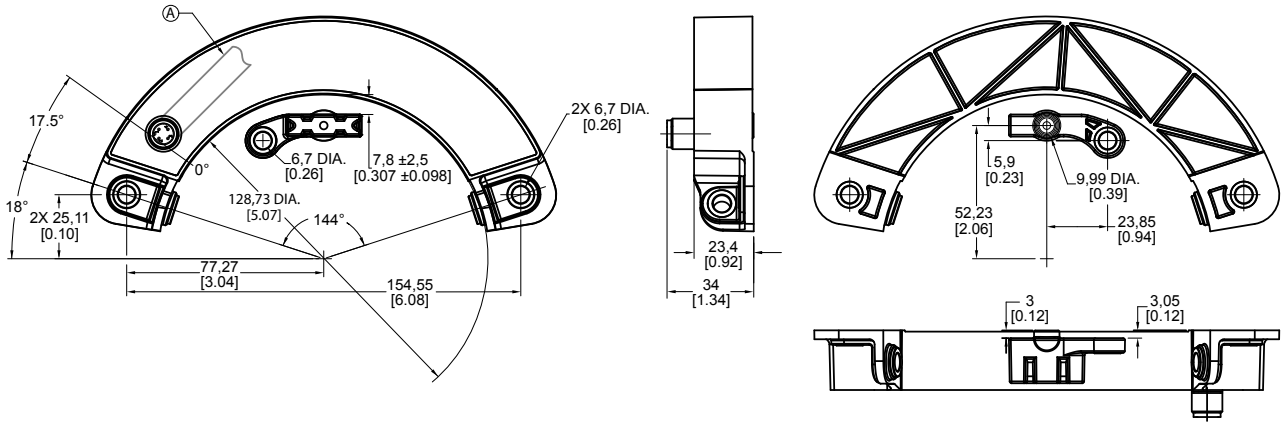
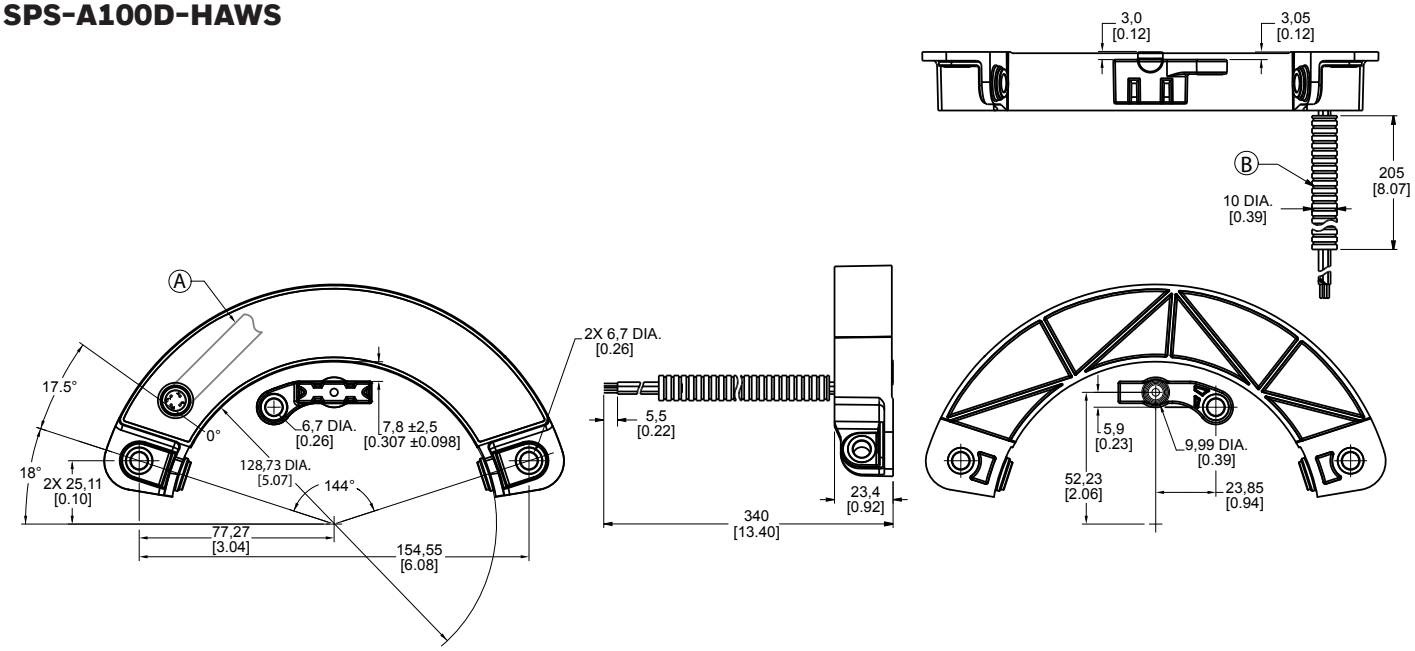


Figure 2. Dimensional Drawings (For reference only: mm/[in].)

SPS-A100D-HAWS

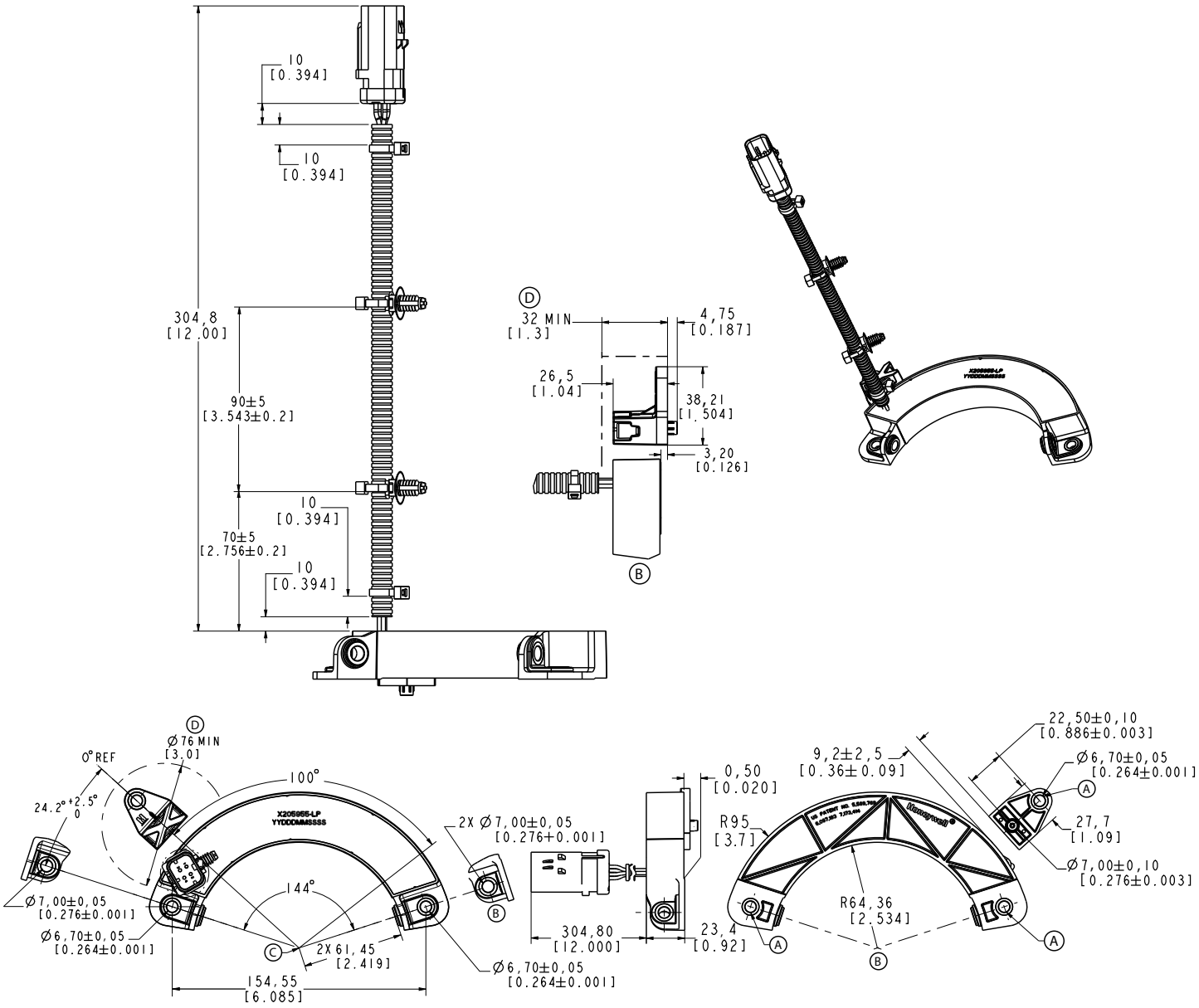


A = Cable direction for right angle connector
B = Polyethylene conduit

SMART ARC 100° & 180°
POSITION SENSOR

Figure 3. Dimensional Drawings (For reference only: mm/[in].)

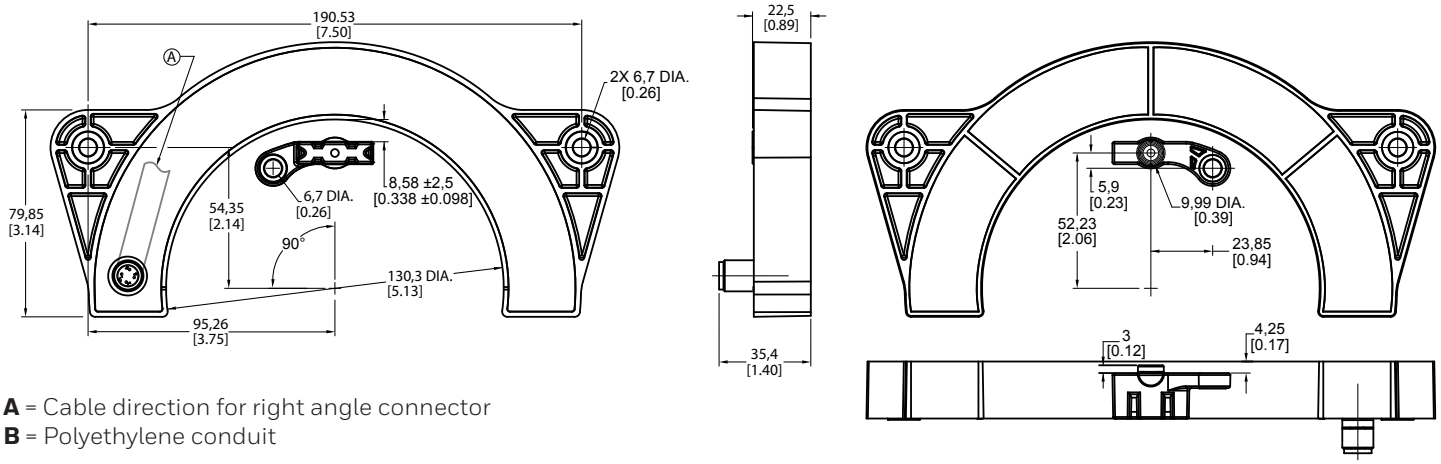
SPS-A100X-LAAS0401



A = Magnet pin locating hole
B = Partial view
C = Rotating axis center
D = Magnetic sensitive zone: protect with a non-ferrous metal shield

Figure 4. Dimensional Drawings (For reference only: mm/[in].)

SPS-A180D-HAMS, SPS-A180D-VAMS



A = Cable direction for right angle connector
B = Polyethylene conduit

Figure 5. Connections

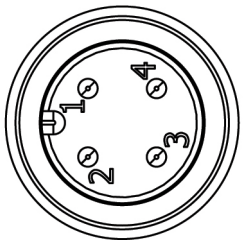
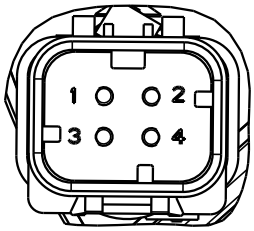
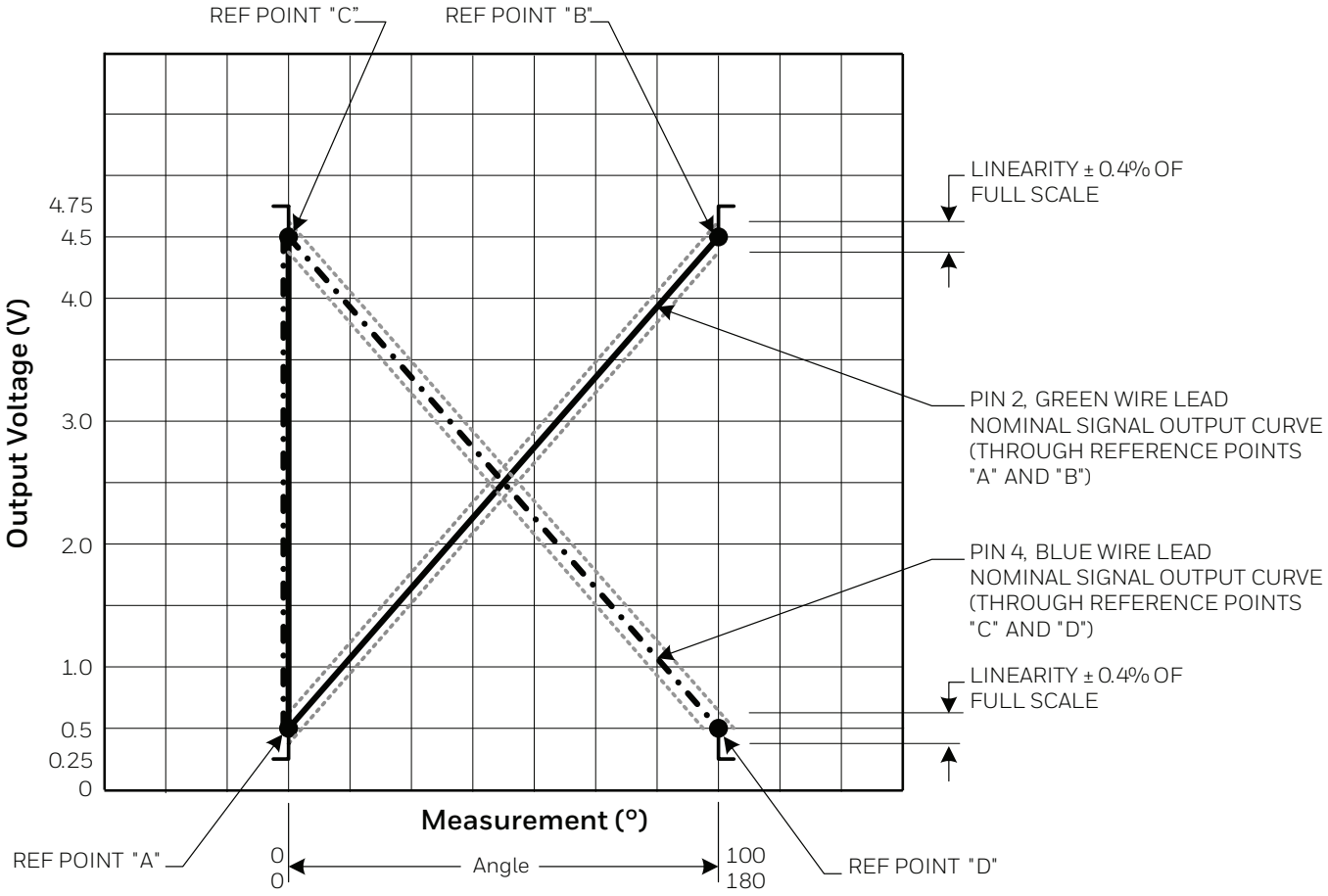
4-Pin M12 Connector	Ampseal 16 Connector (p/n 776536)	18 AWG Flying Leads
SPS-A100D-HAMS, SPS-A100D-VAMS SPS-A180D-HAMS, SPS-A180D-VAMS	SPS-A100X-LAAS0401	SPS-A100D-HAWS
		
Pin 1 = supply voltage (+) Pin 2 = output Pin 3 = ground (-) Pin 4 = inverted output	Pin 1 = supply voltage (+) Pin 2 = output Pin 3 = ground (-) Pin 4 = inverted output	Red wire = supply voltage (+) Green wire = output Black wire = ground (-) Blue wire = inverted output

Figure 6. Sensor Output Performance Chart Showing Ideal Outputs (Applies to all catalog listings.)



Note: Diagnostic for magnet out of range:
green wire lead > 4.55 Vdc; blue wire lead < 0.45 Vdc

TABLE 7. ORDER GUIDE

Part Number	Description
SPS-A100D-HAMS	SMART Position Sensor, 100° arc configuration, 0° to 100° inside sensing range, 6 Vdc to 24 Vdc supply voltage, 0.5 Vdc to 4.5 Vdc analog output, 4-pin M12 connector, magnet actuator included
SPS-A100D-VAMS	SMART Position Sensor, 100° arc configuration, 0° to 100° inside sensing range, 18 Vdc to 40 Vdc supply voltage, 0.5 Vdc to 4.5 Vdc analog output, 4-pin M12 connector, magnet actuator included
SPS-A100D-HAWS	SMART Position Sensor, 100° arc configuration, 0° to 100° inside sensing range, 6 Vdc to 24 Vdc supply voltage, 0.5 Vdc to 4.5 Vdc analog output, 18 AWG flying leads, magnet actuator included
SPS-A100X-LAAS0401	SMART Position Sensor, 100° arc configuration, 0° to 100° outside sensing range, 5 Vdc supply voltage, 0.5 Vdc to 4.5 Vdc analog output, Ampseal 16 connector (p/n 776536), magnet actuator included
SPS-A180D-HAMS	SMART Position Sensor, 180° arc configuration, 0° to 180° inside sensing range, 6 Vdc to 24 Vdc supply voltage, 0.5 Vdc to 4.5 Vdc analog output, 4-pin M12 connector, magnet actuator included
SPS-A180D-VAMS	SMART Position Sensor, 180° arc configuration, 0° to 180° inside sensing range, 18 Vdc to 40 Vdc supply voltage, 0.5 Vdc to 4.5 Vdc analog output, 4-pin M12 connector, magnet actuator included

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship during the applicable warranty period. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgment 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 that Honeywell, in its sole discretion, 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 Honeywell may provide application assistance personally, through our literature and the Honeywell web site, it is buyer's sole responsibility 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 writing. However, Honeywell assumes no responsibility for its use.

⚠ 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.

⚠ WARNING
PERSONAL INJURY

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

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

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 our website or call:

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