INSTALLATION INSTRUCTIONS FOR THE SMART POSITION SENSOR, 100° AND 180° ARC CONFIGURATIONS

50061061
Issue 5

Installationsanleitung für SMART Position Sensor, Ausführung für 100°- und 180°-Bogenkonfigurationen
SMART 位置传感器 **100°** 和 **180°** 角位移传感器安装说明

GENERAL INFORMATION

Why is the SMART Position Sensor smart? SMART means that this is a sensor that can essentially think for itself. The SMART Position Sensor has the ability to self-calibrate because it uses 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 (e.g., elevator, valve, machinery, etc.) so that the object's position can be determined.

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.

MOUNTING AND WIRING INFORMATION

(See Fig. 1.)

1. Locate sensor and magnet in desired position. Ensure that the air gap between sensor and magnet does not exceed that noted in Tables 1-6.
2. Mount sensor:
   - Drill two holes, one for each mounting ear.
   - Secure sensor using two 1/4-20 or M6 screws through each mounting ear.
   - Torque screws to 6 Nm to 8 Nm [53.1 in-lb to 70.8 in-lb].
3. Mount magnet
   - Drill two holes:
     - One for the single mounting ear.
     - One at 10,25 mm ±0,10 mm [0.403 in ±0.004 in] dia., and at least 3 mm [0.118 in] deep, for the mounting dog (helps stabilize magnet).
   - While ensuring the mounting dog is seated in its hole, secure magnet using one 1/4-20 or M6 screw through the mounting ear.
   - Torque screws to 6 Nm to 8 Nm [53.1 in-lb to 70.8 in-lb].
4. Wire sensor according to pinout in Figure 3.

ALLGEMEINE INFORMATIONEN

Was ist das smarte am SMART Position Sensor? SMART bedeutet, dass dieser Sensor nahezu selbständig denken kann. Der SMART Position Sensor ist in der Lage, sich selbst zu kalibrieren. Ermöglicht wird dies durch seine patentierte Kombination aus einem ASIC (Application-Specific Integrated Circuit) und einem Array von (magnetoresistiven) MR-Sensoren, die eine präzise und zuverlässige Bestimmung der Position eines Magneten an einem beweglichen Objekt (z. B. an einem Aufzug, einem Ventil oder einer Maschine) und somit der Position des Objekts zulässt.

Das MR-Array misst die Ausgabe der MR-Sensoren, die entlang der Bewegungsrichtung des Magneten angeordnet sind. Anhand der Ausgabe und der MR-Sensorabfolge wird das zum Zentrum der Magnetposition nächstgelegene Paar von MR-Sensoren ermittelt. Die Ausgabe dieser beiden

MR-Sensoren dient anschließend dazu, die Position des dazwischen angeordneten Magneten zu bestimmen. Mit diesem Sensor hat Honeywell dank dem ASIC eine Anwendung der MR-Technologie realisiert, wie sie bislang noch nicht da gewesen ist.

MONTAGE UND VERKABELUNG

(siehe Abb. 1)

1. Bringen Sie den Sensor und den Magneten in die gewünschte Position. Stellen Sie sicher, dass der Luftspalt zwischen Sensor und Magnet nicht größer ist, als in Tabelle 1-6 angegeben.
2. Montage des Sensors:
   - Erstellen Sie zwei Bohrungen, eine für jede Montageöse.
   - Befestigen Sie den Sensor mit zwei 1/4-20- oder M6-Schrauben pro Montageöse.
   - Ziehen Sie die Schrauben mit einem Drehmoment von 6 Nm bis 8 Nm an [53,1 in lb bis 70,8 in lb].
3. Montage des Magneten:
   - Erstellen Sie zwei Bohrungen:
     - Eine für die Montageöse
     - Eine bei einem Durchmesser von 10,25 ±0,10 mm [0,403 ±0,004 Zoll] und einer Tiefe von mindestens 3 mm [0,118 Zoll] für die Montagemuffe (zur Stabilisierung des Magneten).
   - Stellen Sie den korrekten Sitz der Montagemuffe in der Bohrung sicher und befestigen Sie den Magneten mit einer 1/4-20- oder M6-Schraube durch die Montageöse.
   - Ziehen Sie die Schrauben mit einem Drehmoment von 6 Nm bis 8 Nm an [53,1 in-lb bis 70,8 in-lb].
4. Verkabeln Sie den Sensor entsprechend der Pinbelegung in Abbildung 3.

Honeywell

一般信息

为什么 SMART 位置传感器是智能传感器？SMART 表示该传感器实际上可以独立思考。得益于所采用的 ASIC（专用集成电路）和 MR（磁阻）传感器阵列专利技术，SMART 位置传感器具备自行校准功能，可通过判断附着在移动物体（例如，电梯、阀和机器等）上的磁体的位置，精确可靠地测量出物体的位置。

磁阻阵列可测量沿磁体运动方向安装的磁阻传感器的输出。利用输出和磁阻传感器序列可确定与磁体位置中心距离最近的磁阻 传感器对。然后，这两个磁阻传感器的输出可用于确定它们之间的磁体的位置。凭借该传感器，霍尼韦尔通过ASIC 将磁阻技术应用到了前所未有的水平。

安装和布线信息

(参 考图**1.)**

1. 将感器和磁体置于目位置。确保感器和磁体之间的气隙不超表 1-6 中定的。
2. 安装传感器：:
   - 使用两个孔，每个孔固定一个安装吊耳。
   - 使用两个 ¼-20 或 M6 螺栓穿过安装吊耳以固定传感器。
   - 安装扭矩 6 Nm 到 8 Nm [53.1 in lb 到 70.8 in lb]。
3. 安装磁体
   - 钻两个孔：
     - 其中一个孔固定安装吊耳。
     - 另一个孔的直径 10,25 ±0.10 mm [0.403 ±0.004 in]，深度至少 3 mm [0.118 in]，用于固定安装卡箍（有助于定磁体）。
     - 在确保安装卡箍固定在其孔中的同时，使用一个 ¼-20 或 M6 螺栓穿过安装吊耳固定磁体。
   - 安装扭矩6 Nm 到 8 Nm [53.1 in-lb 到 70.8 in-lb]。
4. 传感器连接方式参照图 3 中的引脚说明。

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

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

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

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

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

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 Vvoltage			
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].)
Abbildung 1. Maßzeichnungen (Nur zu Referenzzwecken; Angaben in mm/in)
1. 尺寸（供参考：MM/IN）

SPS-A100D-HAMS, SPS-A100D-VAMS

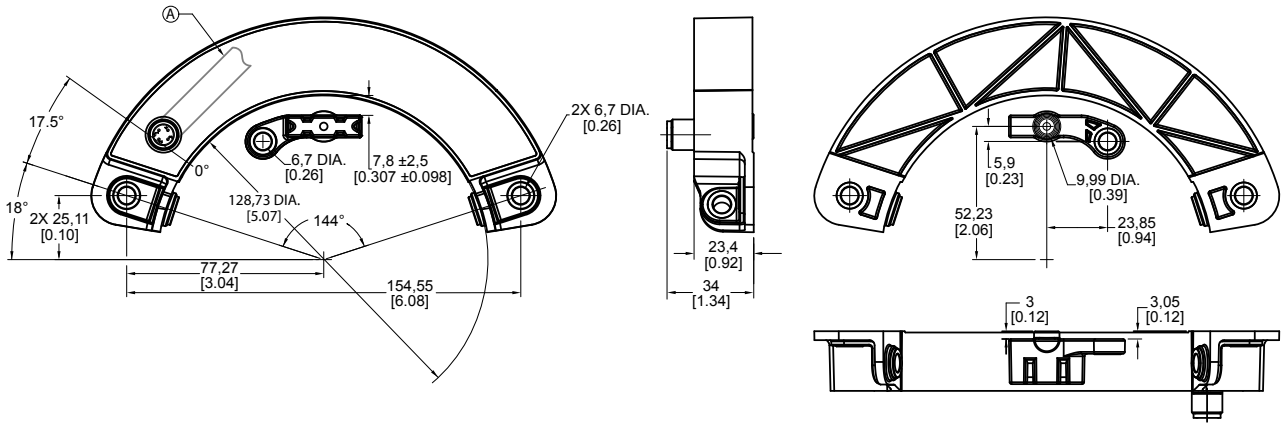
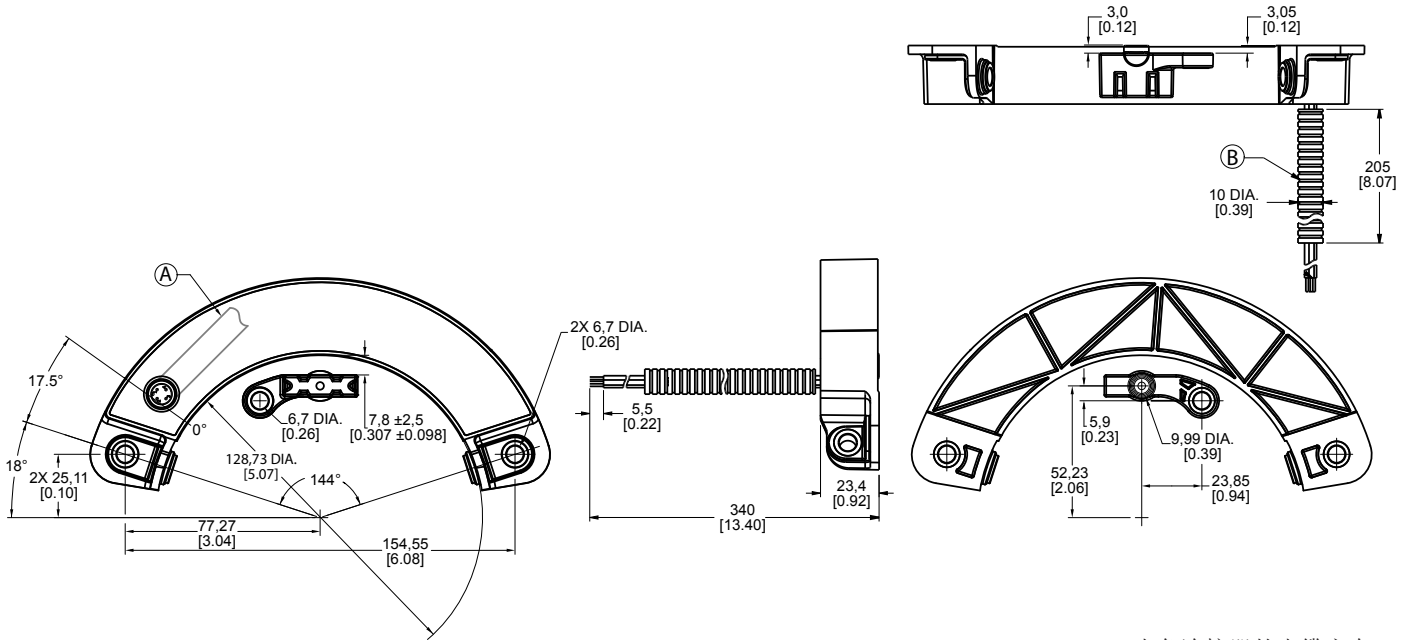


Figure 2. Dimensional Drawings (For reference only: mm/[in].)
Abbildung 2. Maßzeichnungen (Nur zu Referenzzwecken; Angaben in mm/in)
2. 尺寸（供参考：MM/IN）

SPS-A100D-HAWS



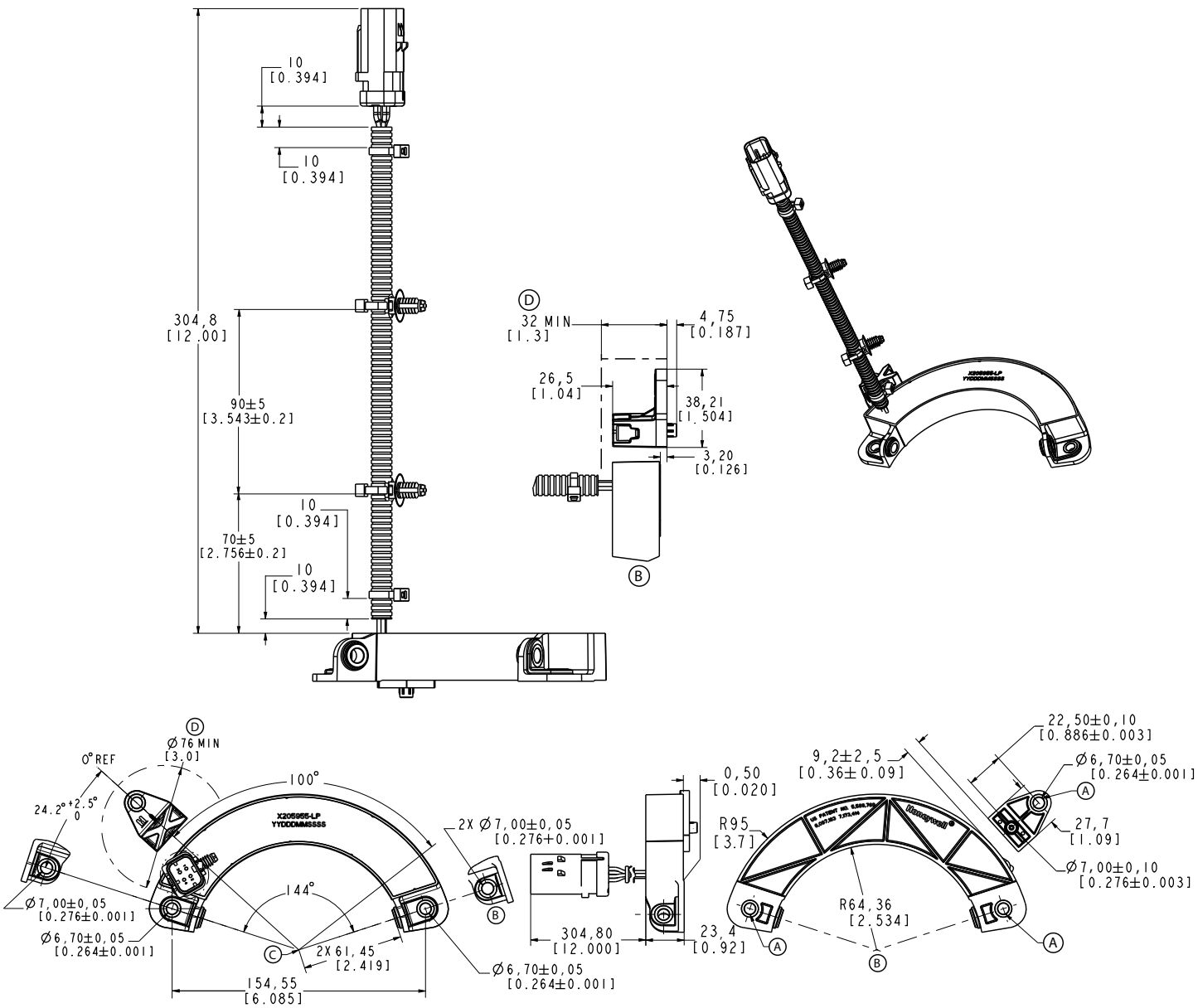
A = Cable direction for right angle connector
B = Polyethylene conduit

A = Kabelrichtung für Winkelsteckverbinder
B = Polyethylen-Conduit

A = 直角连接器的电缆方向
B = 聚乙烯波纹管

Figure 3. Dimensional Drawings (For reference only: mm/[in].)
Abbildung 3. Maßzeichnungen (Nur zu Referenzzwecken; Angaben in mm/in)
3. 尺寸（供参考：MM/IN）

SPS-A100X-LAAS0401



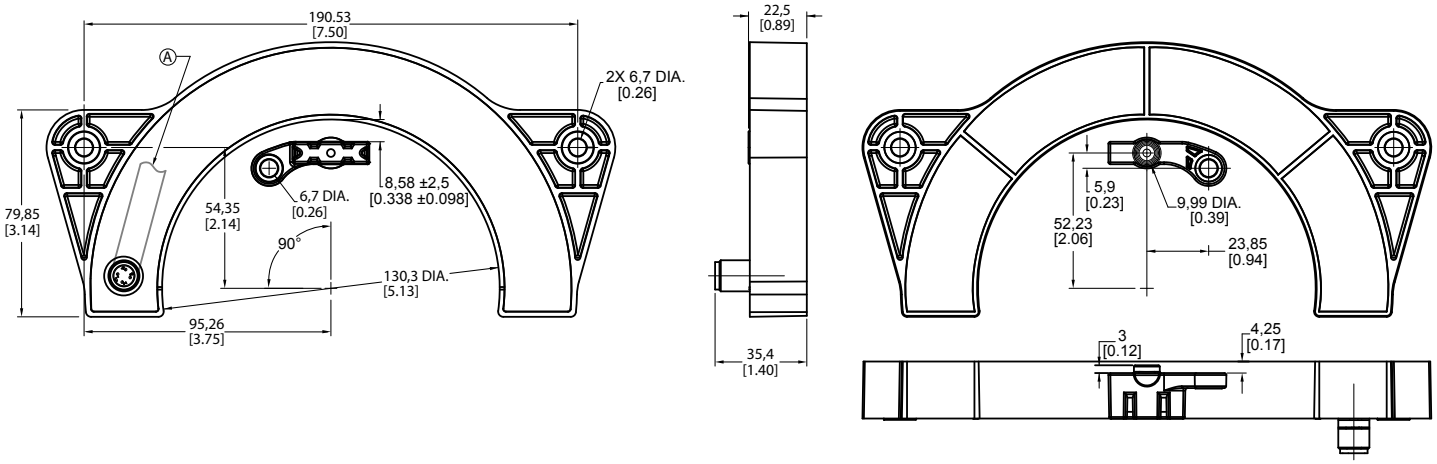
A = Magnet pin locating hole
B = Partial view
C = Rotating axis center
D = Magnetic sensitive zone: protect with a non-ferrous metal shield

A = 磁体钉定位孔
B = 局部视图
C = 旋转轴中心
D = 磁感应区：使用非铁金属护层进行保护

A = Aufnahmebohrung für Magnetstift
B = Teilansicht
C = Mittelpunkt der Drehachse
D = Magnetfeldempfindlicher Bereich: Schutz durch Abschirmung aus Nichteisenmetall

Figure 4. Dimensional Drawings (For reference only: mm/[in].)
Abbildung 4. Maßzeichnungen (Nur zu Referenzzwecken; Angaben in mm/in)
4. 尺寸（供参考：MM/IN）

SPS-A180D-HAMS, SPS-A180D-VAMS



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

A = Kabelrichtung für Winkelsteckverbinder
B = Polyethylen-Conduit

A = 直角连接器的电缆方向
B = 聚乙烯波纹管

Figure 5. Connection, Abbildung 5. Anschluss, 图 5. 接线说明

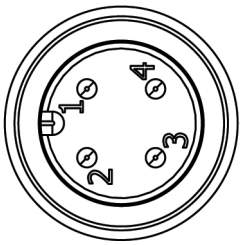
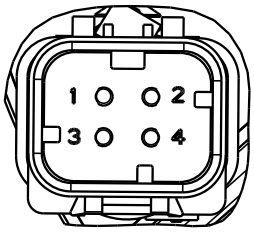
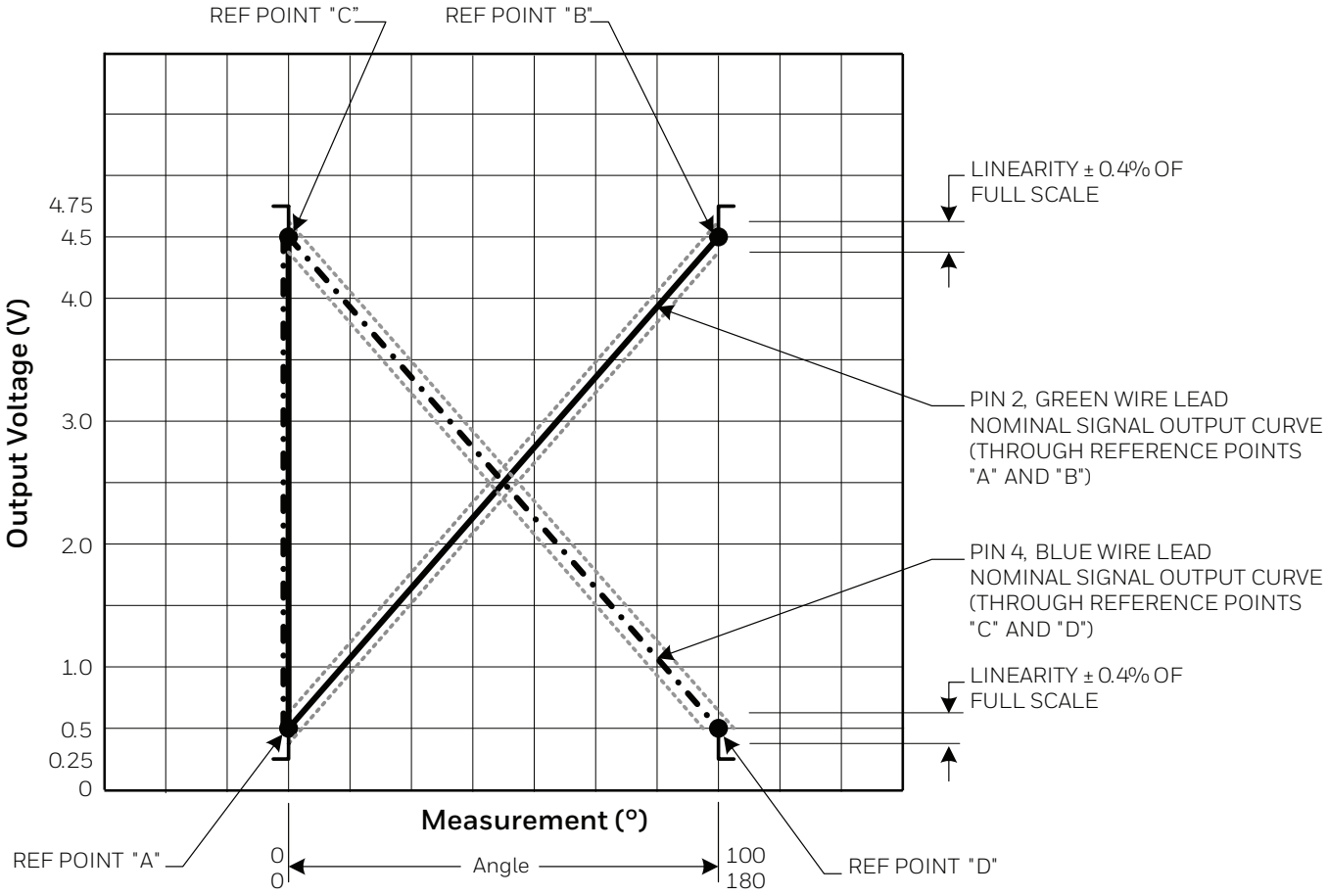
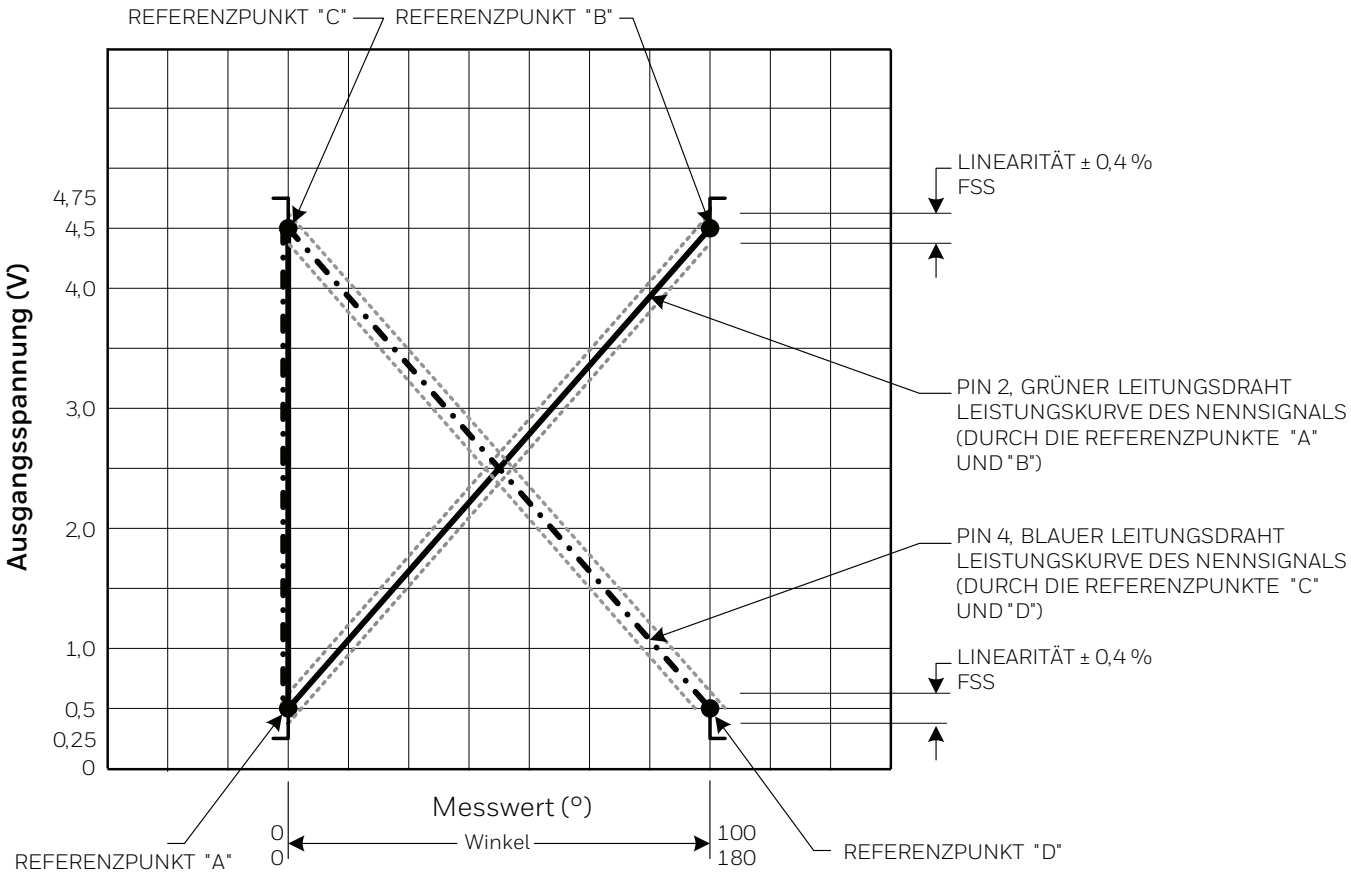
4 Pin M12 Connector Pinout, Pinbelegung, 引脚	Ampseal 16 Connector (p/n 776536)	18 AWG Flying Leads Leitungsdrähte, 导线
SPS-A100D-HAMS, SPS-A100D-VAMS SPS-A180D-HAMS, SPS-A180D-VAMS	SPS-A100X-LAAS0401	SPS-A100D-HAWS
		
Pin 1 = supply voltage (+) Pin 2 = output Pin 3 = ground (-) Pin 4 = inverted output Pin 1 = Versorgungsspannung (+) Pin 2 = Ausgang Pin 3 = Erde (-) Pin 4 = invertierter Ausgang 针脚 1 = 电源电压 (+) 针脚 2 = 输出 针脚 3 = 接地 (-) 针脚 4 = 反向输出	Pin 1 = supply voltage (+) Pin 2 = output Pin 3 = ground (-) Pin 4 = inverted output Pin 1 = Versorgungsspannung (+) Pin 2 = Ausgang Pin 3 = Erde (-) Pin 4 = invertierter Ausgang 针脚 1 = 电源电压 (+) 针脚 2 = 输出 针脚 3 = 接地 (-) 针脚 4 = 反向输出	Red wire = supply voltage (+) Green wire = output Black wire = ground (-) Blue wire = inverted output roter Leitungsdraht = Versorgungsspannung (+) grüner Leitungsdraht = Ausgang schwarzer Leitungsdraht = Erde (-) blauer Leitungsdraht = invertierter Ausgang 红线 = 电源电压 (+) 绿线 = 输出 黑线 = 接地 (-) 蓝线 = 反向输出

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



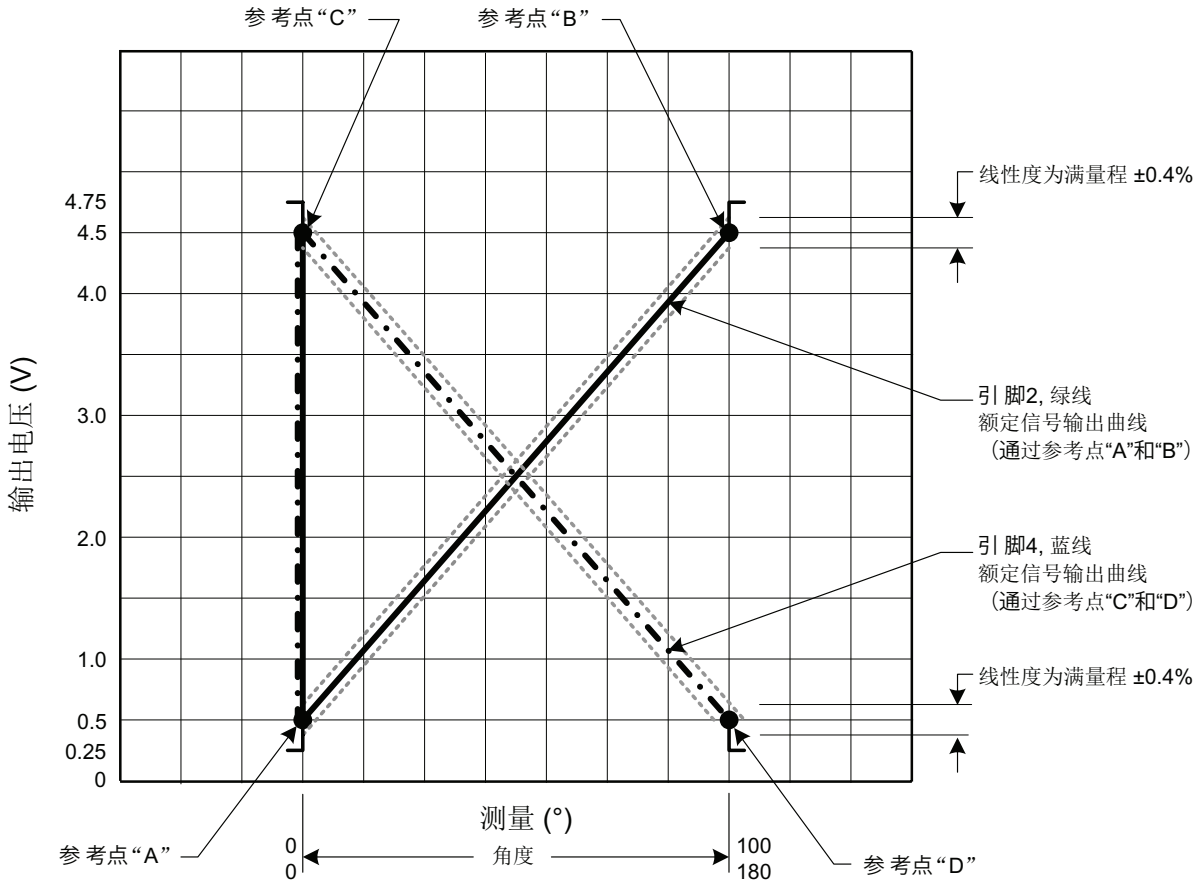
Note: Diagnostic for magnet out of range:
green wire lead > 4.55 Vdc; blue wire lead < 0.45 Vdc

Abbildung 6. Diagramm der Sensorleistung mit idealer Ausgabe (gilt für alle Katalogeinträge)



Anmerkung: Magnet außerhalb der Reichweite: grün Leitungsdraht > 4,55 Vdc; blaue Leitungsdraht < 0,45 Vdc.

图6. 理想状态下的传感器输出性能（适用于所有产品。）



若磁铁位置在感应范围外时：绿线端口输出电压大于4.55 VDC，
蓝线端口输出电压小于0.45 VDC

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Honeywell
Advanced Sensing Technologies
830 East Arapaho Road
Richardson, TX 75081
sps.honeywell.com/ast

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