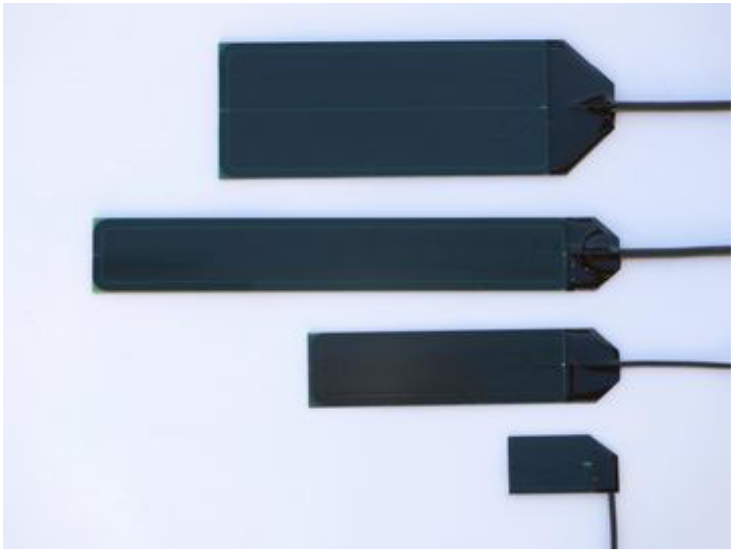
Air Gap Sensor
AGS
Installation and user manual

Valid for serial numbers from S/N: **172306**



Contents

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The conducting of any tests shall be mutually agreed upon and Seller shal be notified of, and may be present at, all tests that may be made.
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Repaired or replacement Products provided as a result of this warranty subparagraph are similarly warranted for a period of thirty (30) days from the date of shipment to Buyer or the remainder of the original ninety-day warranty term for that particular Product, whichever is longer.
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Unless otherwise agreed to in writing by Seller, Seller assumes no responsibility with respect to the suitability of the Buyer's equipment or with respect to any latent defects in the same. This warranty does not cover damage to Buyer's equipment, components or parts resulting in whole or in part from improper maintenance or operation or from their deteriorated condition.Seller does not warrant and will not be liable for any design, materials, construction criteria or goods furnished or specified by Buyer (including that sourced from other manufacturers or vendors specified by Buyer). Any warranty applicable to such Buyer-specified items will be limited solely to the warranty, if any, extended by the original manufacturer or vendor directly or indirectly to Buyer. Seller does not warrant the compatibility of its Products with the goods of other manufacturers or Buyer's application except to the extent expressly represented in Seller's published specifications or written quotation.
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Performance data given in technical documentation is provided only as a guide for the user in determining suitability and do not constitute a performance warranty of any kind. Such data may represent the results of accelerated testing at elevated stress levels, and the user is responsible for correlating the data to actual application requirements. **ALL WARRANTIES AS TO ACTUAL PERFORMANCE, WHETHER EXPRESS OR IMPLIED, ARE EXPRESSLY DISCLAIMED.**

- Installation and maintenance must be performed by qualified personnel familiar with the construction, operation, and hazards involved with the equipment.

- Installation and maintenance must be performed with the control out of operation and disconnected from all sources of power

- Care should be taken when servicing electrostatic sensitive components. The manufacturer's recommendations for these components should be followed.

- Ventilation passages should be kept open.

- The means employed for grounding or insulating the equipment from ground should be checked to assure its integrity.

- Care must be taken to avoid damaging any delicate components and to avoid displacing dust, dirt, or debris in a way that permits it to enter or settle into parts of the control equipment.

- Enclosures should be inspected for evidence of deterioration. Accumulated dust and dirt should be removed from the top of the enclosures before opening doors or removing covers.

1 Overview

- Air Gap Sensor (AGS) is a high accuracy, non contact, capacitive type distance measuring sensor for measuring air-gap in air-cooled generators and electric motors.
- A low profile sensor probe with triaxial cable, preamplifier and conditioner electronics.
- Unique edge mount type for wind generators and electric motors with very small air gap.
- High stability FR4 carbon particles sensor probe made for deep-inside or edge instalation, stator or rotor installation possible.
- Insulated DC/DC power supply and optocoupler output 0...20mA or 4...20mA.
- Stable operation over a wide temperature range of -20...125 / 140°C (sensor probe).
- Splash-proof electronics case (IP66) well suited for field applications.
- Immune to magnetic fields, dust and oil vapours, EMI, RFI....

2 Application

Air Gap sensor is a **capacitive type distance measuring device** designed but not limited for air-cooled generators and electrical motors.
Suited for measuring of air-gap, rotor and stator geometry, winding short circuits detection, etc…
With it`s inherent high sensitivity, high resolution, temperature stability and low noise make it possible to reliably measure distance with resolution up to 20 micrometers (with oversampling).

CAUTION: **AGS is not certified for and shall not be installed in hydrogen-cooled alternators.**

3 AGS selection table

To ensure ample **measurement headroom** please select Air Gap Sensor measuring range according to **the true air gap range** per Table 1. Given dimensions are absolute maximum values.
Air-gap sensor measuring range shall be selected as close to the middle of true air gap range as possible. If in doubt please contact Mikrotrend for help.

Sensor type	AGS-4S	AGS-15N	AGS-25N	AGS-50N	AGS-51N	AGS-65N
Linear measuring distance (mm) (from sensor surface)	0,8...4	3...15	5...25	10...50	5...50	6,5...65
Recommended for true air gap range (mm) (from sensor surface)	**1,7...4,9**	**5,2...17,2**	**8,3...28,3**	**13,3...53,3**	**8,3...53,3**	**9,8...68**

Table 1. Sensor measuring reange vs. true air gap distance (other ranges available per request)

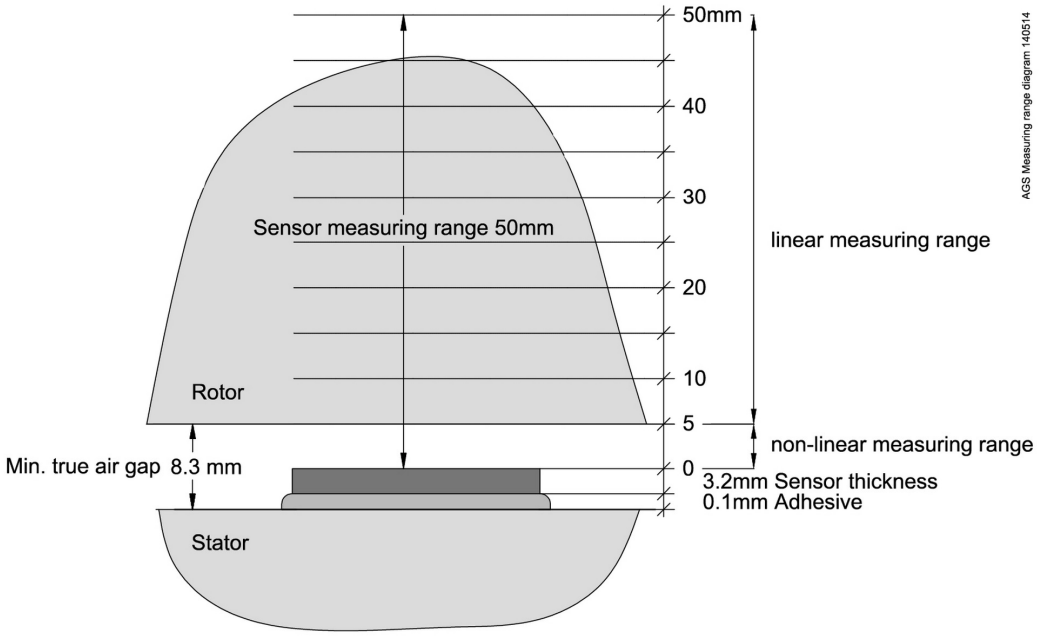


Figure 1. Minimum true air gap vs. measuring range for AGS-51

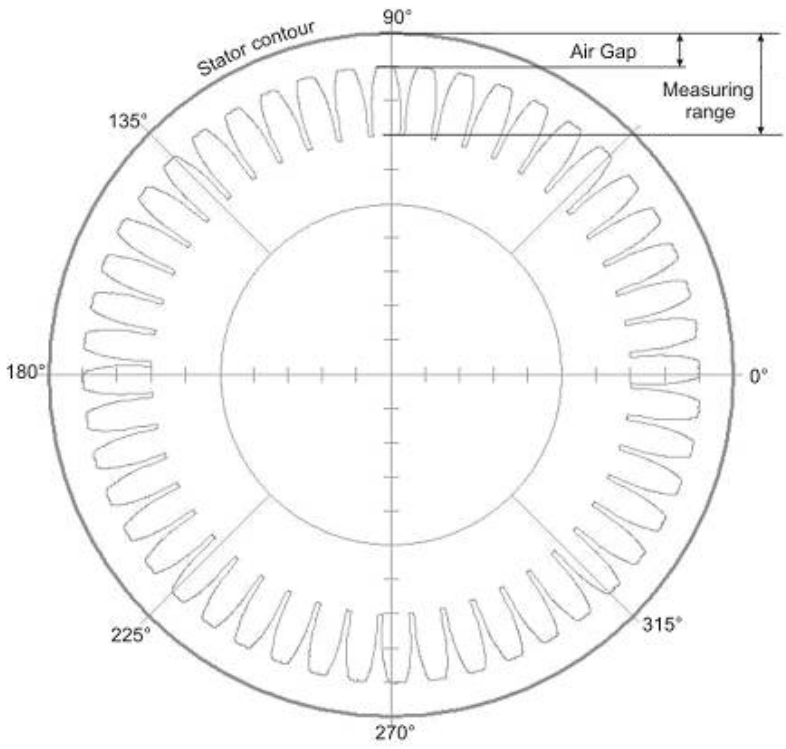


Figure 2: Image of AGS output signal, polar data

4 AGS resolution and output signal samples

Capacitive distance measuring principle is based on the following formula:

C = k x S/d
C = capacity (F), **k** = dielectric constant, **S** = target surface area facing sensor, **d** = distance.

Since area covered by sensor`s measuring surface is small, relative to the rotor pole surface area, a high resolution is possible. Below are samples of recorded waveforms with arrows pointing toward what at first seems electrical disturbance but in fact is threaded hole for pole lifting hoist attachments, (Figure 3, 4, 5).

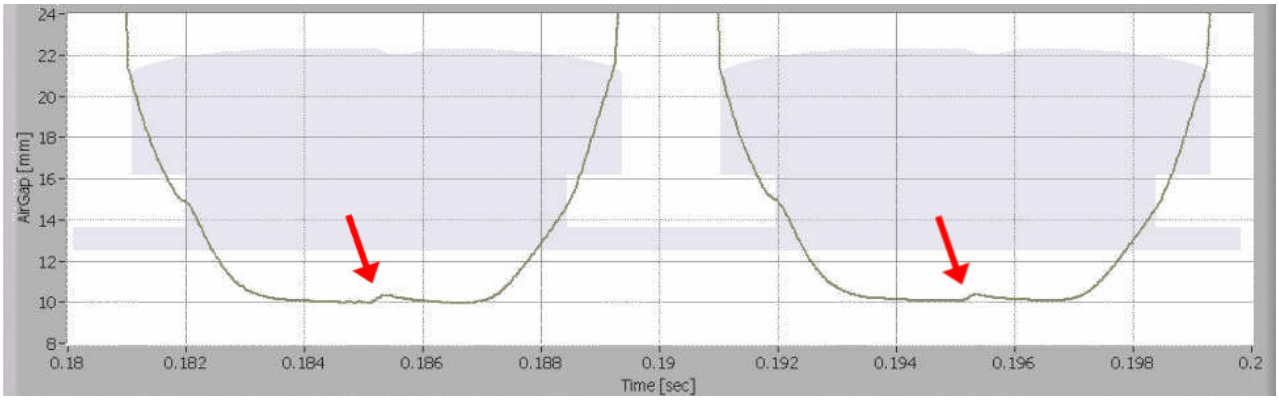


Figure 3: Image of AGS pole profile output signal, (two poles view), arrow showing hoist attachment holles

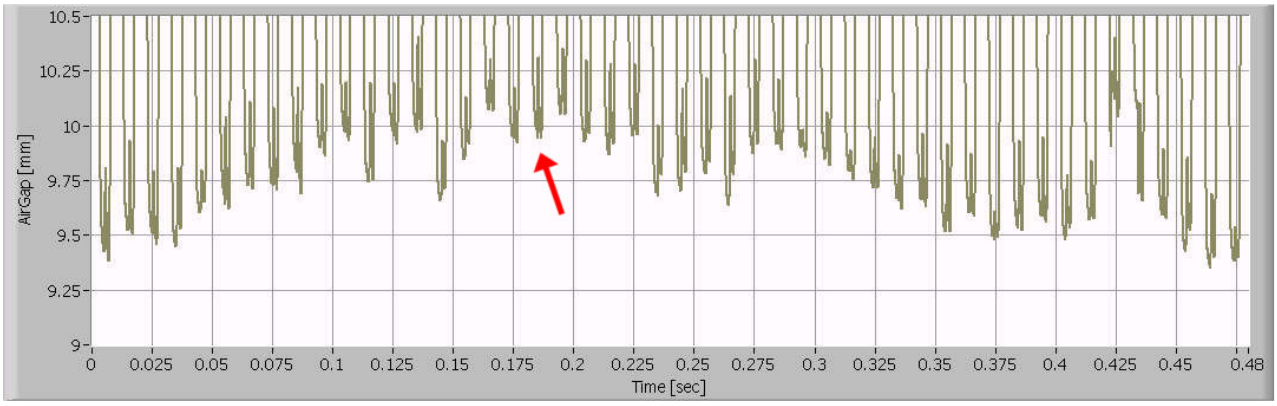


Figure 4: AGS Pole profile output signal (one rotation) arrow showing hoist attachment holles

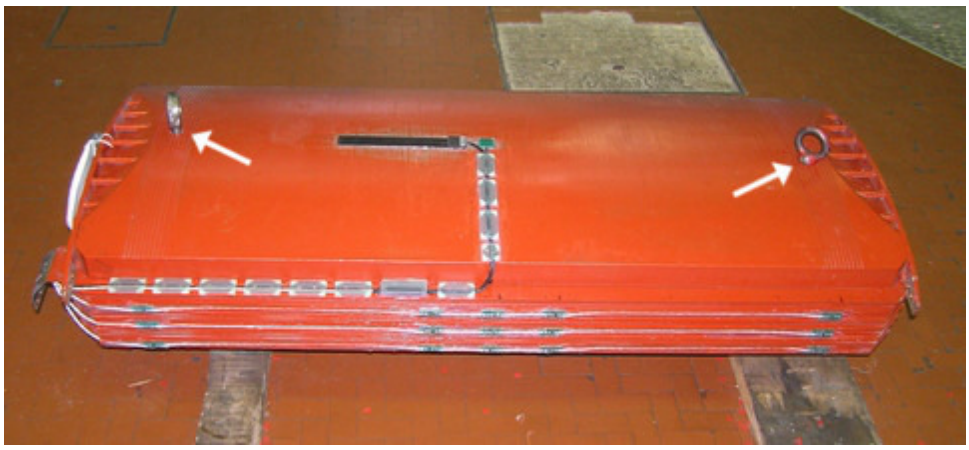


Figure 5: Rotor pole, arrow showing positions of pole lifting hoist attachments

5 Technical specifications

	AGS-4-S (Note 3)	AGS-15-N	AGS-25-N	AGS-50-N	AGS-51-N	AGS-65-N
Measuring range (mm) (from sensor surface)	0...4	0...15	0...25	0...50		0...65
Linear measuring range (mm) (from sensor surface)	0,8...4	3...15	5...25	10...50	5...50	6,5...65
True air gap range (mm)	1,7...4,9	5,2...17,2	8,3...28,3	13,3...53,3	8,3...53,3	9,8...68
Linearity FS (25°C)	+/-1,5%			+/-3%		
Linearity FS (80/80/125°C) (Note 1)	+/-3%			+/-5%		
Linearity FS (80/80/140°C) (Note 2)	+/-3%			+/-5%		
Output noise (% of reading)	0,3% (30mV RMS)					
Repeatability	0,3%					
Output pole profile	0…20mA, (0mA=0mm), or 4...20mA (4mA=0mm) with 500 Ohm termination resistor: 0...10V (0V=0mm) or 2...10V, (2V=0mm) opto-insulated					
Sensitivity 0...20mA output (mA/mm)	5	1,33	0,8	0,4	n.a.	
Sensitivity 0...10V output (V/mm)	2,5	0,667	0,4	0,2	n.a.	
Sensitivity 4...20mA output (mA/mm)	4	1,067	0,64	0,32		0,2462
Sensitivity 2...10V output (V/mm)	2	0,533	0,32	0,16		0,1231
Typical frequency response	0...1000Hz, (-3dB), other bandwidth optional					
Magnetic flux density withstand	+/-2 Tesla, 50/60Hz					
Operating temp. (probe only)	-20...125°C or -20...140°C					
Operating/store temperature (AGSC + preamplifier)	-20...80°C					
Power input	+24Vdc, ±10%, 0,15A max.					
Warm-up time	approx. 20 min.					
Relative humidity (AGSC)	95% non condensing					
Vibration	IEC 68 2.27, 5 g peak, 10 Hz to 150 Hz					
Shock	IEC 68 2.27, 15 g peak, 11ms					
EMC	Sensor probe not affected by magnetic fields +/- 2 Tesla, 50/60 Hz					
Probe immunity	magnetic fields, dust and oil vapours, without degradation of material					
AGSP probe dimension (mm)	51x25x0,8	135x32x2,2 (Note 4)	232x32x3,3	175x60x3,3		265x60x3,3
AGSP cable length (m)	0,8m + 10m, optional: 0,8m + 20m		1,8m + 10m, optional: 1,8m + 20m			
AGSC dimension (mm)	220 × 120 × 80 w/o cable inlets type CAB, 220 x 125 x 55mm type CON					
AGSC protection class	IP66 type CAB, IP60 type CON					
Weight AGSP (probe + cable) (g)	6g + 230g	20g + 230g	50g + 250g	100g + 250g		150g + 250g
Weight AGSC unit	1500g type CAB, 720g type CON					

Table: 2 Technical specification

NOTES:
(1) AGSC signal conditioner at 80°C, Preamplifier at 80°C, AGSP probe at 125°C.
(2) AGSC signal conditioner at 80°C, Preamplifier at 80°C, AGSP probe at 140°C.
(3) AGS-4S is recommended for generators or motors with permanent magnet rotors only.
Not to be used with Switching power regulators when mounted at the stator edge position due to possible electrical noise pickup from nearby windings. If necessary perform trial installation to verify proper operation.
(4) AGS-13 and AGS-15 sensor probe tickness from serial number 153601 onward has been changed from 1.2mm to current probe tickness of 2.2mm.

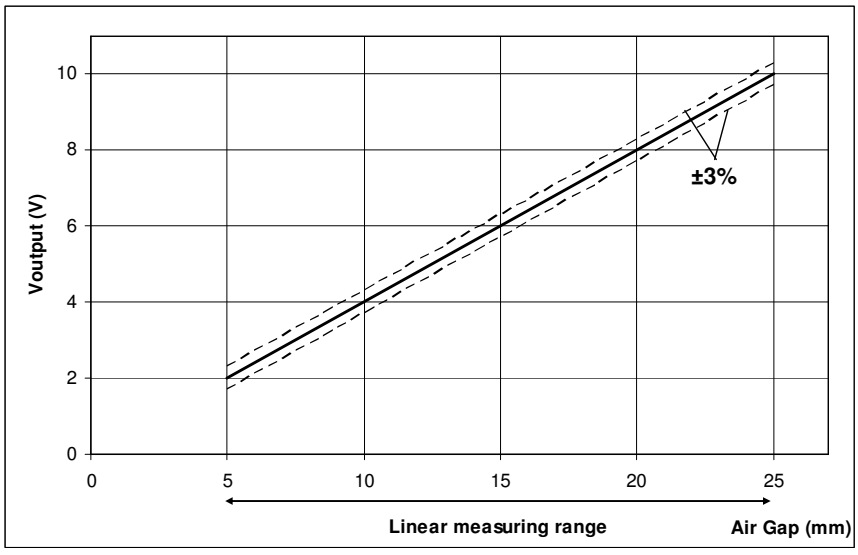


Figure 6. AGS-25 Linearity definition for +/-3% of reading

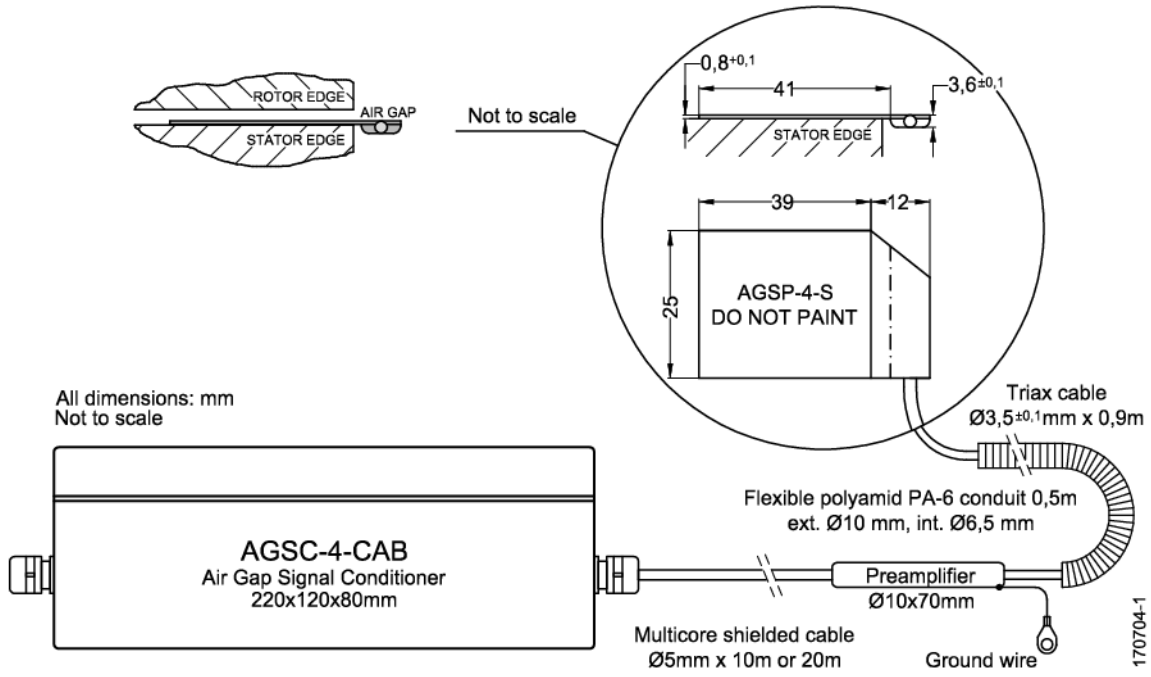


Figure 7. AGS-4S (cable attachment inverted type) outline drawing

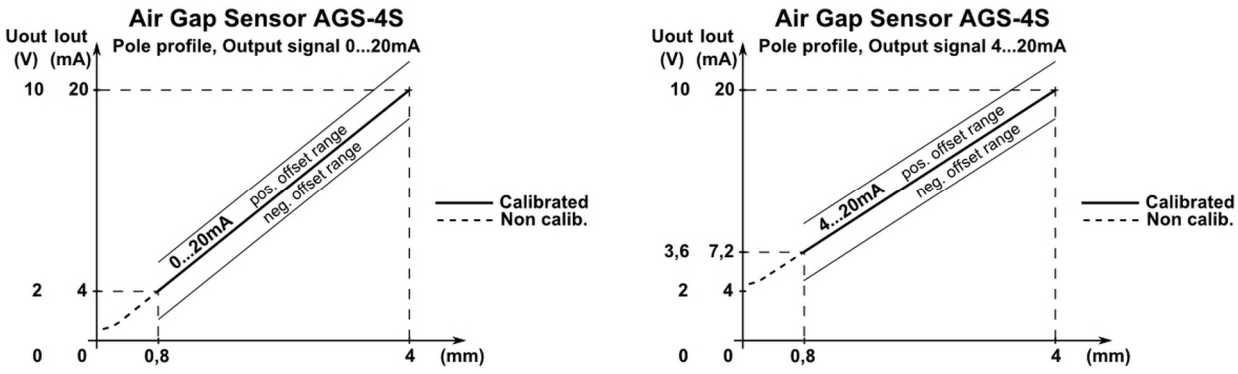


Figure 8. AGS-4S output signal diagrams

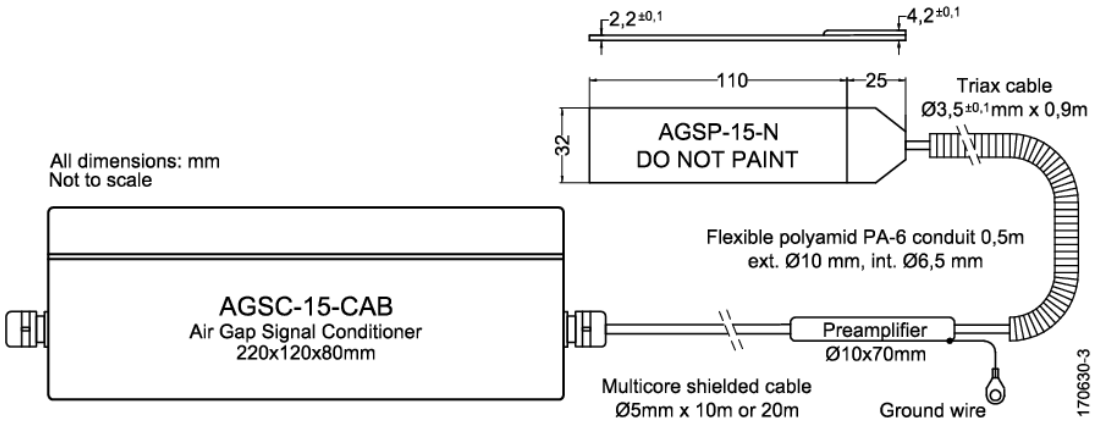


Figure 9. AGS-15-N outline drawing from ser. Nr.153601

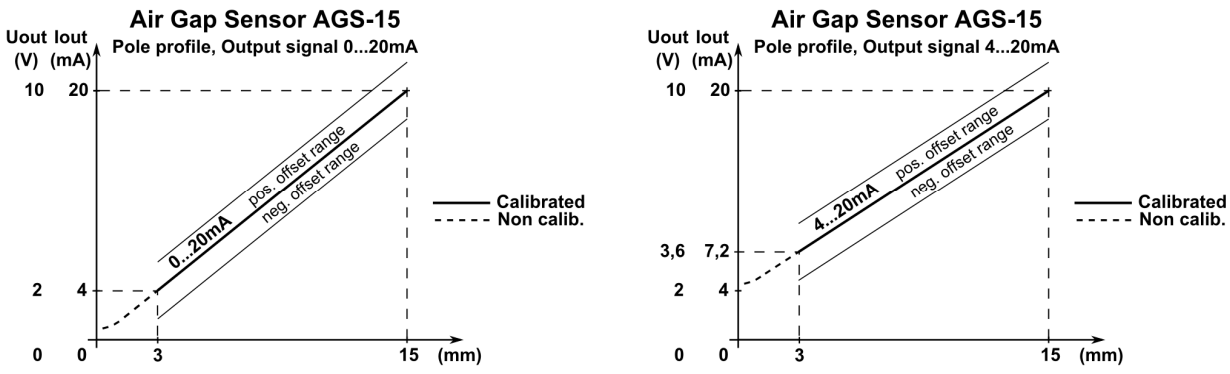


Figure 10. AGS-15-N output signal diagrams

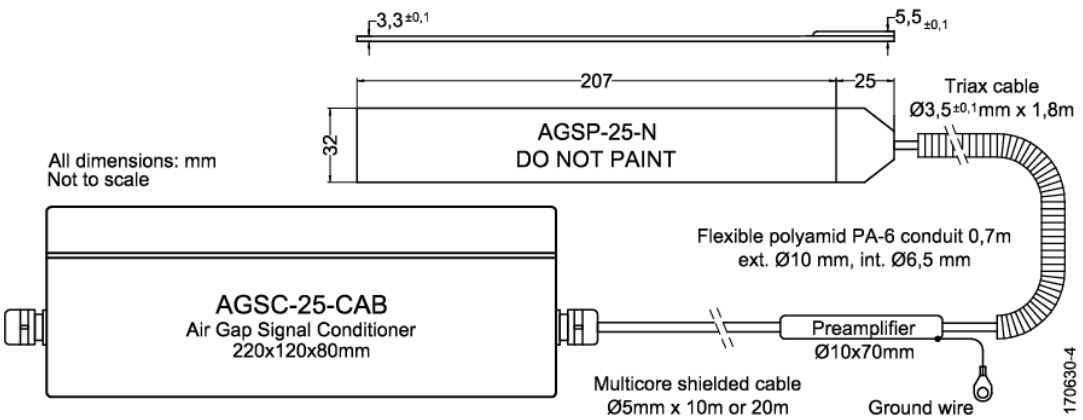


Figure 11. AGS-25-N outline drawing

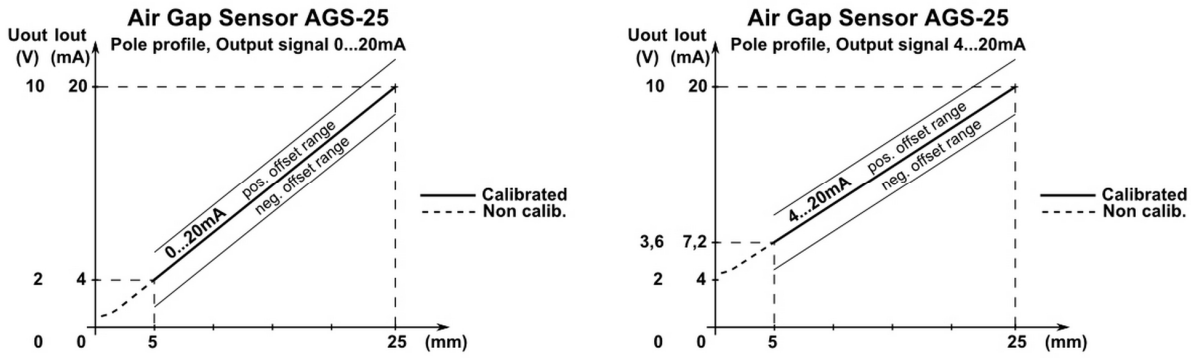


Figure 12. AGS-25 output signal diagrams

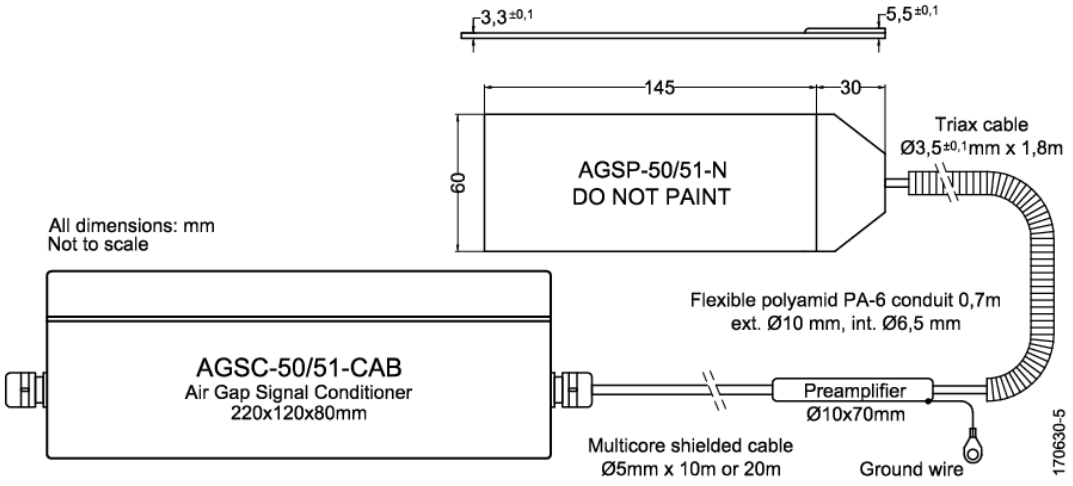


Figure 13. AGS-50 / AGS-51 outline drawing

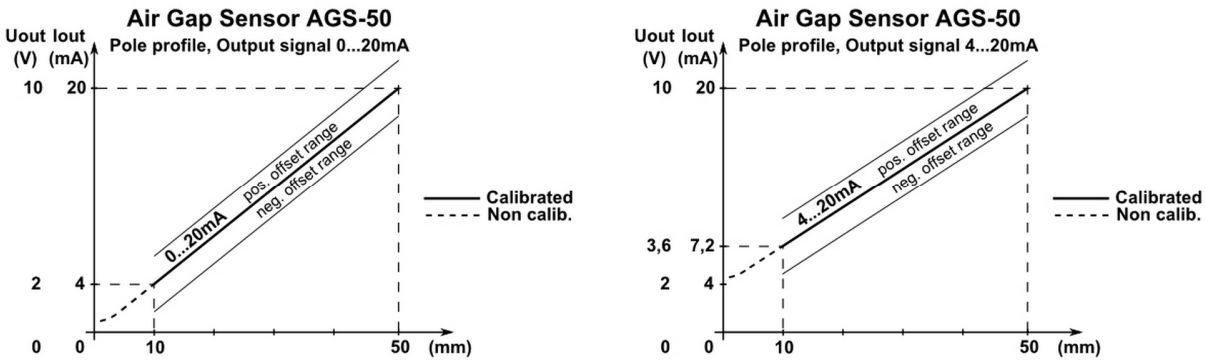


Figure 14. AGS-50 output signal diagrams

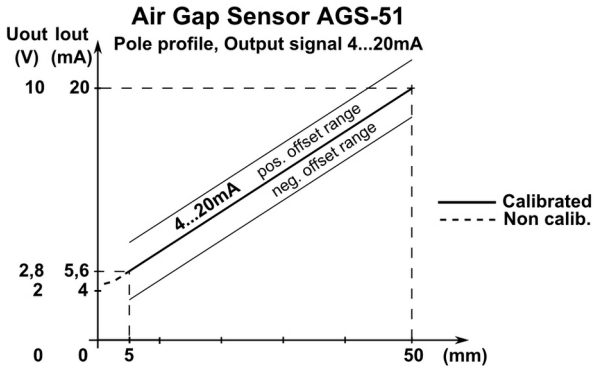


Figure 15. AGS-51 output signal diagrams

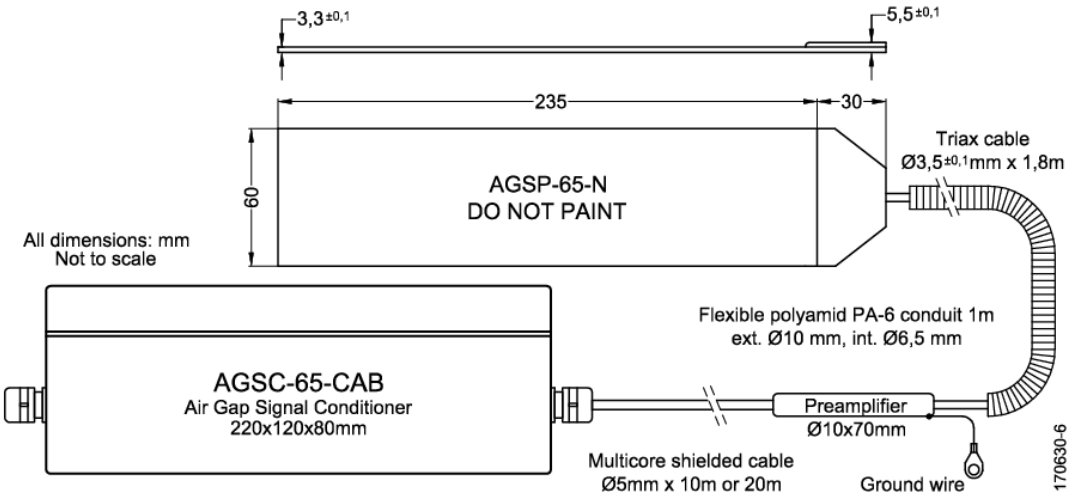


Figure 16. AGS-65 outline drawing

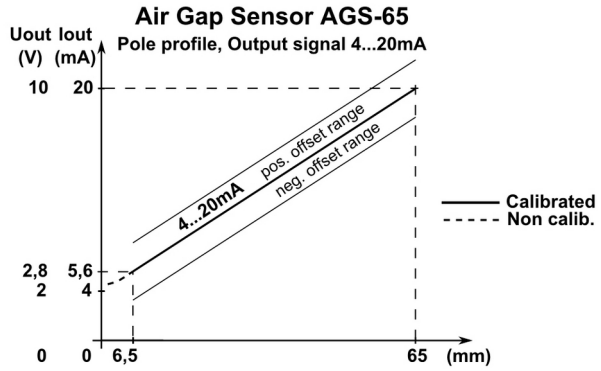


Figure 17. AGS-65 output signal diagrams

6 Installation instructions

6.1 AGSC Signal Conditioner unit installation guide

Please select AGSC signal conditioner enclosure type:

a) Sealed enclosure with connectors, prefered enclosure type, use for Stator installation. Water and oil proofed IP60 cable connectors allow for easy installation **without opening** enclosure cover.
Offset adjustment possible from outside without opening.
Practical and simple installation within door-and-hinge box for EMC protection of cable wires. No need to open and no replacement of desiccant needed.

NOTE: ***Sealed enclosure must be placed inside auxiliary door-and-hinge enclosure for EMC protection of connection wires.***

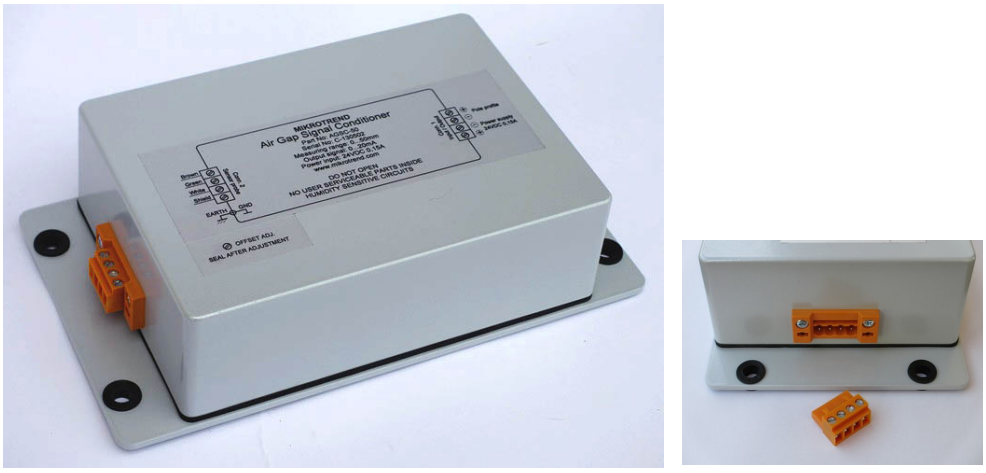


Figure 18. AGSC Signal Conditioner unit, sealed enclosure with connectors (CON)

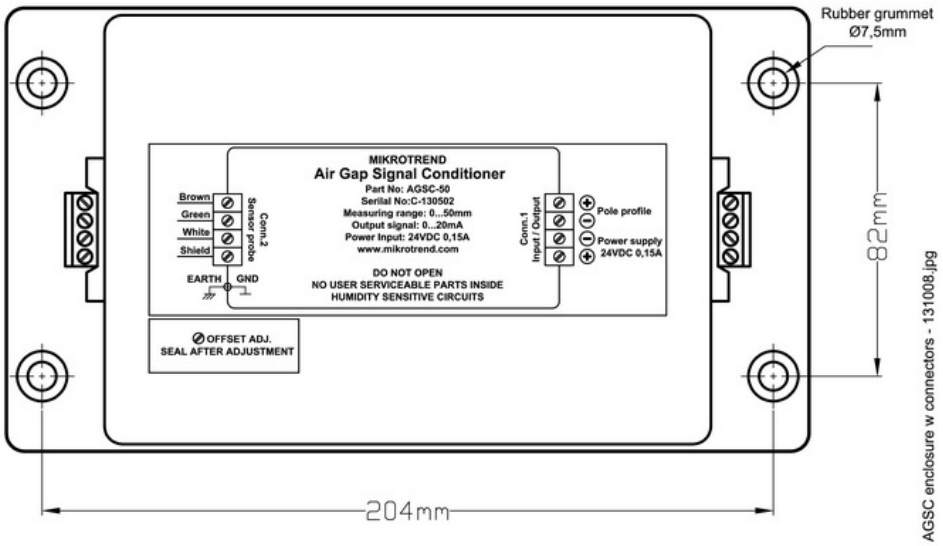


Figure 19. AGSC Signal Conditioner unit, sealed enclosure with connectors (CON), (mounting dimensions)

b) Enclosure with cable inlets, use for Rotor mounted and stand alone installation **where no door-and-hinge enclosure is available** for protection.
Cables can be installed with tight fitting, oil and water proofed up to IP64.

NOTE: ***For AGSC-CAB units before S/N:144701:***
AGSC enclosure contains humidity sensitive circuits and must be closed during operation, .
Replace desiccant after prolonged opening and allow at least 12h to dry-up before calibration and /or measuring.
Later S/N numbers are fully sealed and does not need desiccant (Figure 20).

Figure 20. AGS Signal Conditioner unit enclosure with cable inlets (CAB) (after S/N 144701)

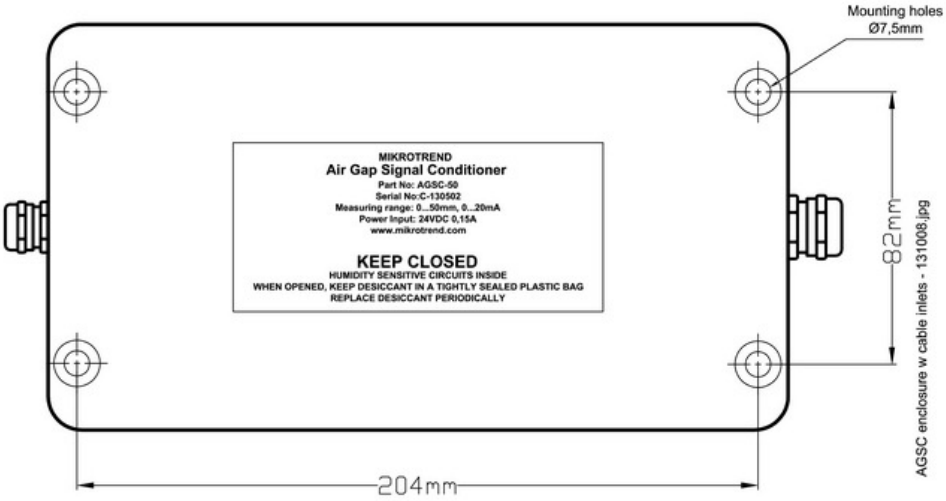


Figure 21. AGS Signal Conditioner unit enclosure with cable inlets (CAB), (mounting dimensions)

6.2 Appropriate location for AGSC Signal Conditioner unit

Distance up to 10 / 20 meters from the sensor probe (longer distance is possible, please enquire).
Distance up to 200 meters from AGSC acquisition unit with 0...20mA loop. If voltage output is used, interference free distance may vary, depending on type of wiring and nearby equipment which my generate electromagnetic disturbance.
- Prefer well ventilated, dry area free of vibrations and stray magnetic fields,
- Ensure adequate grounding for enclosure with minimum lenght of wire,
- Ensure access to 24 VDC / 0,15A power supply.

NOTE: ***When using enclosure with connectors auxiliary enclosure with door and hinge is mandatory to shield AGSC signal conditioner wires from environmental influences, for EMC protection etc.***

6.3 Thermal considerations and thermal zones

Life time of electronic components and MTBF hours depend on thermal load and ambient temperature. AGS electronics is designed to provide more than 20 years of continuous service if installed properly. As a general rule for every 10°C increase of ambient temperature above maximum specified, components life time will be halved.
It is important to consider installing AGS components in locations which will ensure minimum thermal stress and therefore longest life time.
Thermal zones are pictured in Figure 22. Technical specifications are given for these maximum continuos permisible temperatures. However, AGS components will endure higher temperatures for short periods with no apparent damage but life time will be affected accordingly.

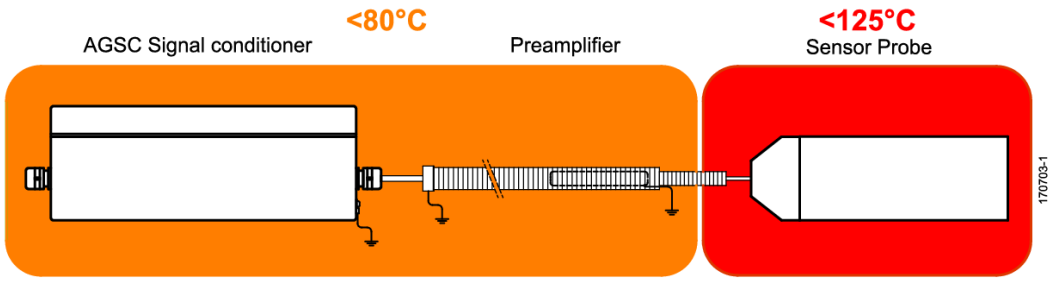


Figure 22. Thermal zones (from S/N: 172306)

6.4 Grounding of AGSC Signal Conditioner unit

CAUTION: ***Grounding is essential for system operation integrity as well as for protection against hazardous voltages. For best grounding, provide the shortest path possible between the AGSC signal conditioner unit and the grounded structure.***
Use flexible steel conduit to protect all cables from electromagnetic fields except inside of stator winding where PVC conduit shall be used. Keep ample distance from nearby power lines (Figure 30).

WARNING: ***MULTICORE CABLE SHIELD SHALL BE GROUNDED AT ACQUISITION CARD INPUT ONLY. MULTIPLE GROUND POINTS WILL CAUSE NOISE PICK-UP AND CAN DAMAGE CONDITIONER UNIT ELECTRONICS.***

6.5 Power supply connection

Power to AGSC signal conditioner unit shall be 24VDC, ±10%, 0,15A max.
Conditioner unit input has insulated DC-DC converter allowing any pole to be grounded or floating power supply as well as daisy chain of several Conditioner units.

6.6 Calibration

The **AGSP** sensor probe and **AGSC** signal conditioner units are factory matched and calibrated for best performance. However if needed, may be calibrated at site. For details please contact Mikrotrend.

6.7 AGSP Sensor probe installation guide

CAUTION: ***AGSP sensor probe shall be handled with care.***
Do not apply paint or silicone to the sensor surface.
Never pull or use excessive force on the sensor cable or preamplifier.

The sensor surface is treated with high quality insulation varnish, it shall not be scrached as damage to semiconductive electrodes may occur.

6.8 Placing the sensor probe

Choose position for AGSP sensor probe considering number of sensors and machine poles.
True acurate rotor/stator geometry can be obtained with one (1) Rotor mounted Air Gap Sensor and four (4) Stator mounted Air Gap Sensors, upper side and four (4) at lower side.
(http://www.mikrotrend.com/wrm-wireless-hydrogenerator-rotor-monitor.htm)

If **Wireless Rotor AGS** is not used than good practical results are achieved with the following configurations: (**Figure 23.)**

- generator diameter of less than **7,5 meters:** 4 sensors for upper and 4 for lower side,
- generator diameter of **7,5…12 meters:** 8 sensors for upper and 8 for lower side,
- for **larger diameters**: 12 to 16 sensors per side.

Economy solution for vertical machines would be to place the sensors on the upper side of the stator only as it will have higher excentricity than the lower side. For stator height of more than 1,8 meters (vertical machines) air gap sensors should be placed on both sides (upper and lower side).

Sensor shall be glued against stator laminations as deep as practical in the air gap or at stator edge if EDGE type of sensor probe is to be used.
In general, this is beneath the second ventilation hole. The preamplifier (small cylinder shape integrated within the cable) **must** stay outside of the air gap and outside of the endwindings, if possible outside of the stator casing.

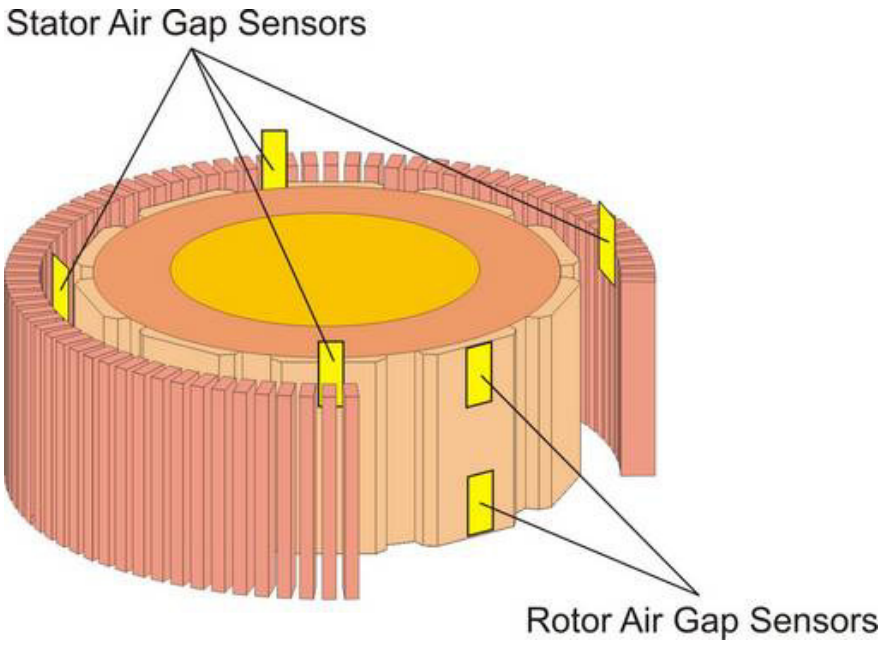


Figure 23. Air Gap Sensor probe positions

6.9 Preparing the stator surface

Thoroughly clean the stator surface, use allowed cleaning liquid such as isopropanol alcohol, disposable cotton fabric and fine non-metallic sandpaper.

WARNING: ***DO NOT USE ACETONE, MEDICAL ALCOHOL OR OTHER SOLVENTS.***
Medical alcohol contains oils and additives, other solvents may damage sensor surface!

Use a clean rag moistened with isopropanol over the stator surface to remove oil and carbon deposits. Epoxy coated or painted stator laminations inspect for **mechanical stability**. If necessary polish the surface and/or remove unstable particles with **non-metallic** sandpaper.

CAUTION: ***Sensor´s bottom surface shall be insulated from stator iron.***
Sensor´ bottom surface is coated with insulating varnish and a thin coat of adhesive will provide additional insulation.

After sanding, once again clean stator surface with a rag moistened with isopropanol.
The glue surface should be flat, without protruding laminations, Slight unevenness can be tolerated (± 0.5mm).
Let the isopropanol evaporate at room temperature for about 10 minutes before proceeding with glue application.

6.10 Mounting the sensor

The **AGSP** sensor probe shall be aligned with the plane area of the rotor pole. A small misalignement may be compensated with offset adjustment. The sensor measuring surface shall be entirely covered by the pole surface.
We recommend three metods for fastening the sensors, each with different curing times and operating temperatures:

CAUTION: ***Commonly found Epoxy adhesive is not flexible enough. The sensor may come off due to uneven surface tensions during high load periods on generator.***

A. Double sided tape, (150°C):
Double Side adhesive 3M Scotch Acrylic Foam Tape VHB 4611.

With glue thickness of 1mm, a foam type tape will allow stator unevenness of up to 0,3 mm. Alowed temperatures of 149°C (for weeks) and short time up to 230°C (hours).
Clean the back surface of the sensor with a cotton rag moistened with isopropanol.
Place double sided adhesive tape on the back side of the sensor . Remove protective foil and carefully place sensor in position without touching adhesive surface. Using protective gloves or a rag press the sensor firmly against the stator surface. Adhesive is pressure sensitive and reacts on the first applied pressure. The sensor can be put in use imediatelly after gluing, full strenght will be reached after 24 hours.

B. Silicone sealant-adhesive, non-acid (neutral), high temperature
TEMPFLEX Loctite 5145 (250°C)

Our prefered mounting technique with high flexibility and high holding force. This is only metod recommended for **Wireless Rotor AGS** where high G-forces are present. Standard operation temperatures from -85...250°C, short time up to 300°C.
A must for locations where stator surface coating has low adhesion to stator laminate. Silicone adhesive/sealant effectively compensates uneven surface tensions during high load periods on generator thus ensuring stable mounting of the sensor.
With paper adhesive tape, mark border area about 5 mm larger on each side than sensor surface.
Apply Silicone sealant about 1mm thick, evenly spread over entire **back surface** of the sensor.
Carefuly place sensor within paper covered opening and firmly press until sealant stops comming out.
Wipe of excess sealant with paper towel until clean and remove adhesive paper border.
Fix the sensor in position with adhesive tape (Power-Tape) for at least 6 hours.Full curing times up to 24 h. shorter with higher ambient moisture.

C: Two component glue (short curing time) LOCTITE MULTIBOND 330
continuous operation temperature not exceding 80°C

If stator laminate coating is strong and stable, You can use two component adhesive type **LOCTITE MULTIBOND 330**. It is quick and simple application, but flexibility is not great and above mentioned precautions about surface stability and operating temperature shall be observed.
When generator is under heavy load and if surface is not stable enough, the sensor may come off due to stator core tensions which adhesive cannot compensate.
Clean the back surface of the sensor with a rag moistened with alcohol.
Follow manufacturers instructions. Curing times will vary with surface temperature, 50% of the final strength is reached after 10...30 minutes, full strength after approx. 5 hours.

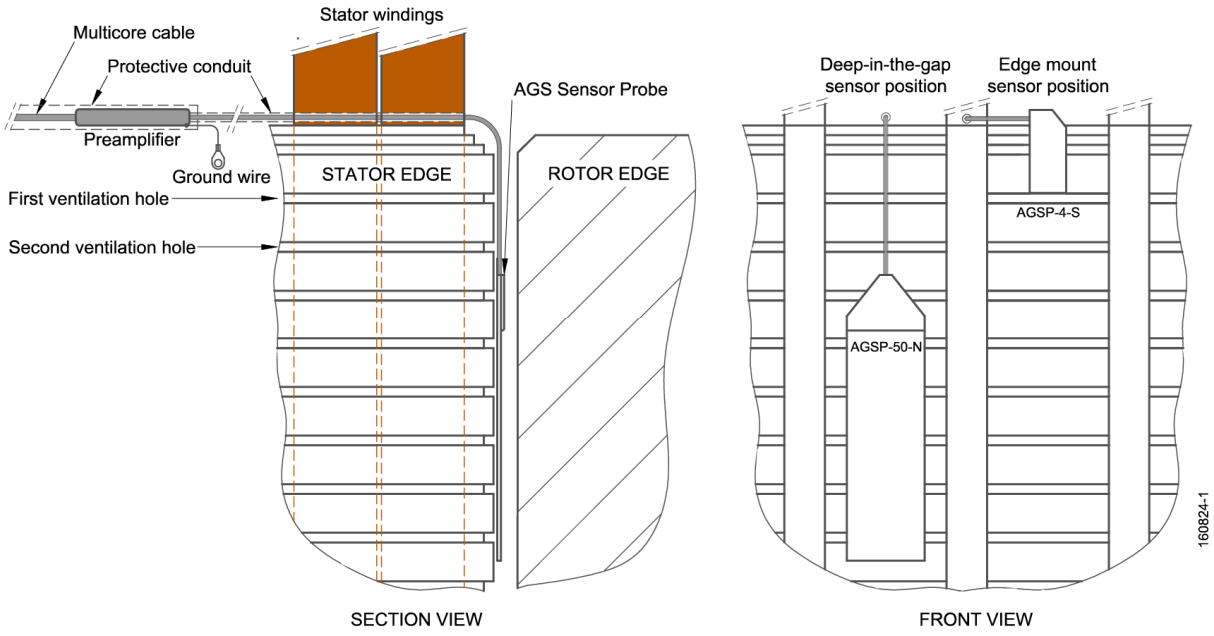


Figure 24. Air gap sensor probe mounting position diagram

Figure 25a. AGS Sensor probe mounting position showing triax cable and silicone coating

Figure 25b. AGS Sensor probe protective conduit inside stator winding with silicone coating

Figure 26. AGSP sensor probe installed at stator surface
(AGS sensor pictured on the left, magnetic field sensor on the right side)

Figure 27. AGSP sensor probe installed at rotor pole
(AGSP sensor pictured next to Magnetic field sensor in the middle of rotor pole)

6.11 True air gap and offset

The output of the signal conditioner provides the distance value between **the sensor surface and rotor pole**.
Offset is the distance between the stator surface and sensor surface, including the thickness of the glue:

Offset = glue thickness+sensor thickness, varies with sensor type and mounting metod.

True air gap is sum of measured and offset value.
Offset compensation shall be made at the monitoring system and displayed value will be True air gap distance.

NOTE: ***Before attempting new offset adjustement let AGSC Signal conditioner unit be powered for 20...30 minutes.***
Slowly turn trimmer potentiometer labeled **Offset adj.** untill reaching required output current or voltage. Normally, very small rotation will provide large changes on output.

CAUTION: ***DO NOT adjust other trimmer potentiometers*** **(factory adjustment only).**

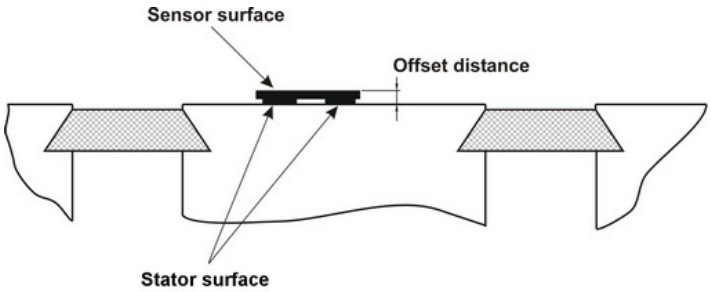


Figure 28. AGS - Offset distance

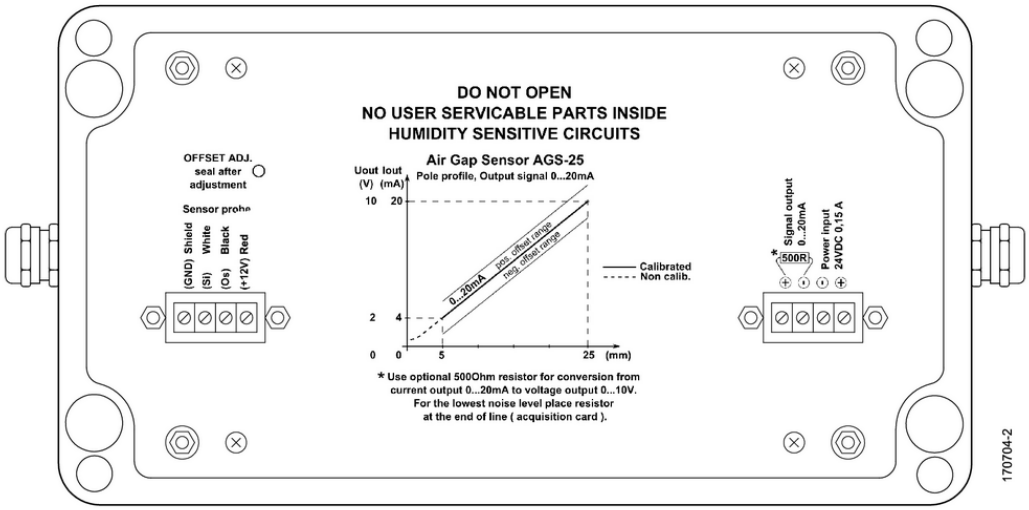


Figure 29. AGSC - signal conditioner, cable inlet enclosure, adjustments (after S/N 144701)

6.12 Cable installation

WARNING: ***BEWARE OF HIGH VOLTAGES ON THE STATOR BARS (5...22 KV). DO NOT ATTACH TRIAXIAL CABLE DIRECTLY TO THE STATOR BARS. THE TRIAXIAL CABLE, PREAMPLIFIER AND MULTICORE SHIELDED CABLE MUST BE PROTECTED BY A FLEXIBLE OR SEMI-RIGID STEEL WITH POLYETHYLENE (PVC) CONDUIT, (Figure 30.)***

CAUTION: ***The triaxial cable shall not be modified.***

Muticore shielded cable (between preamplifier and signal conditioner unit) **may be shortened** if neccesary. This will change output readings approx. 3% / met. Please adjust offset accordingly.
Gently preshape the triaxial cable by hand to get the right form, avoid to bend it beyond a right angle with minimum bending radius of 30mm.
Immobilize the triaxial cable inside the air gap to prevent vibrations and/or mechanical displacement:
-hold the triaxial cable temporary with Cyanoacrylate type adhesive, point-glued to the stator laminations (iron) surface.
-applly Silicone sealant along the cable in the air gap up to the exit toward stator windings, making a strong permanent bond (Figure 25a, 25b).

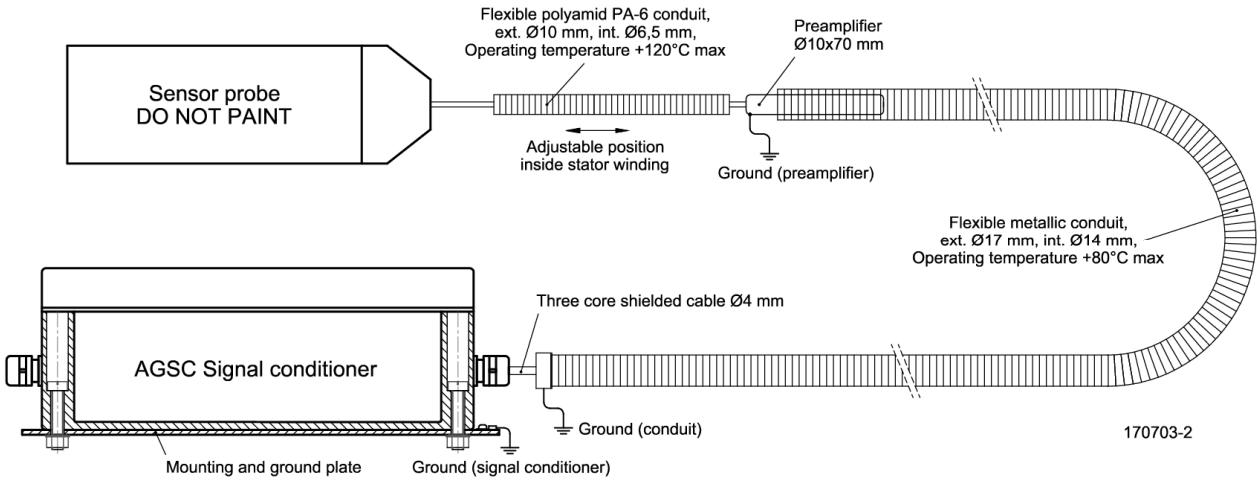


Figure 30. Air Gap Sensor AGS Shielding and grounding (conduit not a part of delivery, to be ordered separately)

6.13 Connection to AGSC conditioner unit

The Figure 31 illustrates how to connect the multicore cable to the AGSC conditioner unit.

Pole profile output gives instantaneous air-gap value measured by the sensor (Fig. 2, 3 & 4).
It is optocoupled and insulated from sensor ground and also from power supply negative.
Output shall be grounded at acquisition card input.
Output signal can be ordered as 0...20mA or 4...20mA.

NOTE: ***When 0...10V output is needed instead of 0...20mA, a current to voltage conversion resistor of 500 ohms should be placed at the end of line at the acquisition unit (for the lowest noise level).***

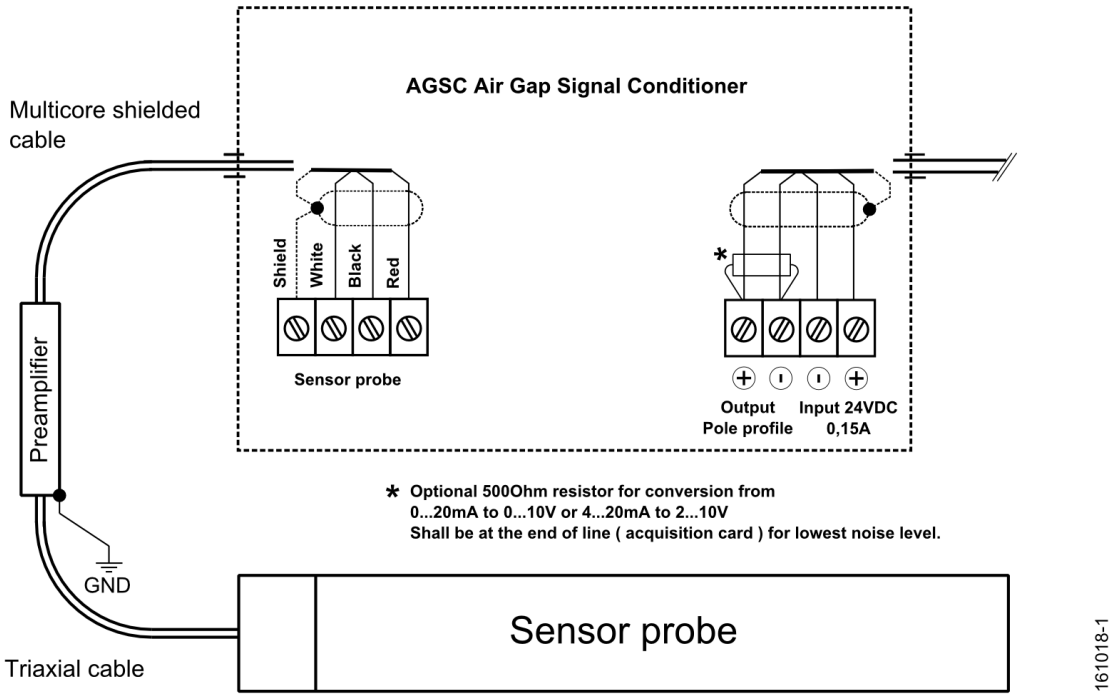


Figure 31. AGS Wiring diagram (from S/N: 172306)

Output signal examples:

Distance (mm)	Iout (mA)	Vout (V) at 500 Ohm
0	0	0
5	4	2
25	20	10

Table 3a. AGS-25 0...20mA 0,8mA/mm, Output example

Distance (mm)	Iout (mA)	Vout (V) at 500 Ohm
0	4	2
5	7,2	3,6
25	20	10

Table 3b. AGS-25 4...20mA 0,64mA/mm, Output example

7 Troubleshooting

7.1. Q: Output signal drift with change of temperature/humidity:

A:

7.1.1. **For units before S/N 144701:**
Altough Air Gap Sensor Probe (AGSP) is not temperature sensitive, Air Gap Signal Conditioner (AGSC) contains humidity sensitive components which can cause significant output signal drift if humidity enters AGSC enclosure. Each AGSC unit shall contain a fresh desiccant pack.
Please keep desiccant in tightly sealed zip-bag during installation or, better, replace desiccant every time AGSC enclosure is opened.
OFFSET adjustment shall be made **only** after fresh pack of dessicant has been installed for at least 12 hours, (time needed to dry AGSC electronics components).
Another option is to use **AGSC-x-x-CON** enclosure which has connectors for cable installation and OFFSET adjustment is possible without opening.

7.1.2. **For units after S/N 144701:**
New enclosure for electronics with protection from humidity.
No desiccant replacement needed.
OFFSET adjustment trimmer shall be sealed with adhesive tape after adjustment.

7.2. Q: Pole profile output signal higher / lower than nominal:

A:

7.2.1. Check the distance to pole surface is within measuring range.

7.2.2. Check Sensor or Triax cable for damages.

7.2.3. If replacement sensor probe is connected to already installed Signal Conditioner to adjust for proper signal output, slowly turn OFFSET adjustment trimmer potentiometer until reaching desired output.
Please see also 7.1 (Output drift with change of temperature / humidity)

7.3. Q: 50/100Hz and/or higher frequency noise in pole profile signal:

A:

7.3.1. **EMC protection with metallic cable conduits are mandatory for AGS installation (Figure 30).**
Most important for generators with newer Switching power regulators in the Exciter circuit, which are a source of broadband electrical noise

7.3.2. **Check grounding scheme. Ground loops shall be avoided (Figure 30).**

NOTE: **Installations before S/N 144701 will have lower noise level with modification as per Figure 30. Main ground connection is placed at the preamplifier body. Calibration is not affected with this modification.**

Pole profile output signal is electricaly floating, however minus pole shall be grounded at acquisition card input (preffered) or AGSC enclosure, **but not at both sides**.

Please **do not allow multiple grounding** ie. at AGSC **and** at acquisition card unit **and** at monitoring PC-power supply, **and** at Ethernet adapter, etc. Use opto-isolated Ethernet adapters if needed.

7.3.3. **Air Gap Signal Conditioner** unit will tolerate aprox 0,2 Tesla of stray magnetic fields. If stronger fields are present use aditional protection-box made from ferromagnetic material or move to another location.

8 Ordering information

Scope of delivery:
NOTE: Metalic conduit is not part of delivery, to be ordered separately

AGS Air Gap Sensors are delivered as a factory calibrated set containing:
- **P/N: AGSP** sensor probe with integrated preamplifier and connection cable,
- **P/N: AGSC** signal conditioner.

When ordering AGSP sensor probe please use the following format:

AGSP - [XX] - [X] - [XXX] - [XX]

Lin. measuring range (mm):
0,8…4 = **4**
3…15 = **15**
5…25 = **25**
10…50 = **50**
5...50 = **51**
6,5…65 = **65**

Installation type:
Deep-in-the-gap mount = **N**
Edge mount = **S**

Operating temperature:
0...125°C = **125**
-20...140°C = **140**

Cable length:
10m = **10**
20m = **20**

When ordering AGSC Signal Conditioner please use the following format:

AGSC - [X] - [XX] - [XXX]

Lin. measuring range (mm):
0,8…4 = **4**
3…15 = **15**
5…25 = **25**
10…50 = **50**
5...50 = **51**
6,5…65 = **65**

Output signal:
0...20mA = **0**
4...20mA = **4**

Enclosure type:
With cable inlet = **CAB**
With connectors = **CON**

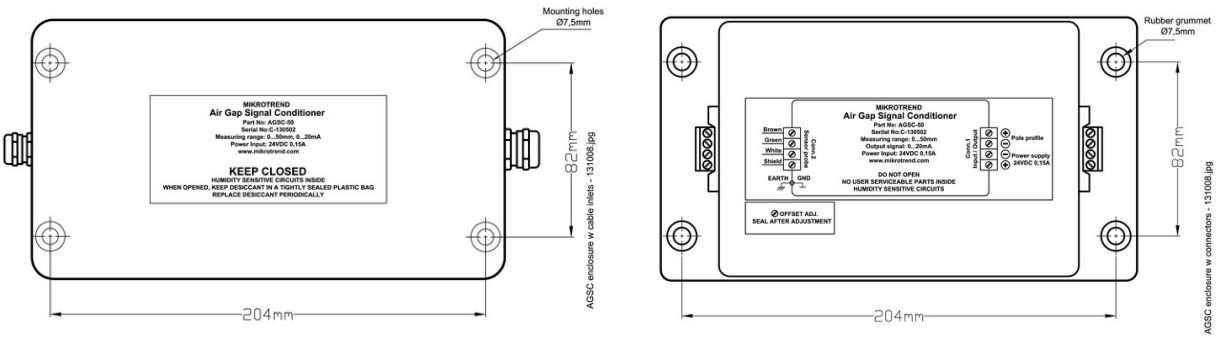


Figure 32. AGSC-CAB (left), AGSC-CON (right)

9 Manufacturers Test and Calibration Report

Air Gap Sensors are individualy calibrated and Manufacturers Test and Calibration report (MTR) included with each unit as per sample below:

Manufacturer:	**MIKROTREND d.o.o.** 4.Bizek 14, 10090 Zagreb, CROATIA
	e-mail: info(at)mikrotrend.com , www.mikrotrend.com
Date:	02. June 2017
Ambient:	22°C
Test performed by:	**K. Pavlovic**

Manufacturers Test and Calibration report No. (sample)

Scope of testing: sensor output at specified distance

Passed

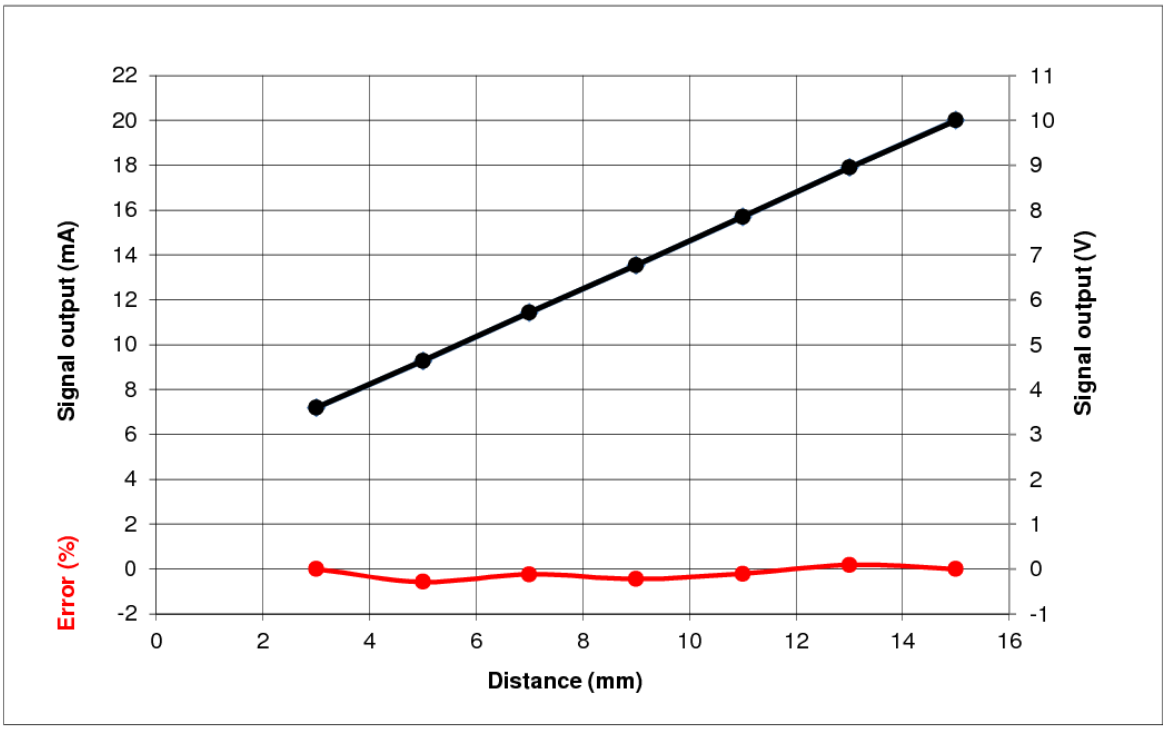
The product and the factory surveillance system meet all applicable requirements as laid down in the relevant datasheets and/or Installation and user manual

Product name:	**Air Gap Sensor Probe**	Part No:	**AGSP-15-N-125**	Ser. No:	**(sample)**
	Air Gap Signal Conditioner	Part No:	**AGSC-15-4-CAB**	Ser. No:	**(sample)**
Measuring range:	**0...15mm**	Linear measuring range:	**3...15mm**		
Output:	**4...20mA or 2...10V**				
Sensitivity:	**1,06667mA or 0,53334V/mm**				

Calibration Instrument used:

Z-axis:	**Custom design with vacuum table**
Laser Micrometer:	**Keyence LC-2100, Ser. No. 004936**
Micrometer:	**Mitutoyo ID-H0560, Ser. No. 002450**
Multimeter:	**Agilent 34401A, Ser. No. US36115736**

Distance	Signal output		Error	Signal output	
d(mm)	Ioutput(mA)	Imeasured(mA)	(%)	Voutput(V)	Vimeasured(V)
3,00	**7,20**	**7,20**	**0,00**	**3,60**	**3,60**
5,00	**9,33**	**9,28**	**-0,57**	**4,67**	**4,64**
7,00	**11,47**	**11,44**	**-0,23**	**5,73**	**5,72**
9,00	**13,60**	**13,54**	**-0,44**	**6,80**	**6,77**
11,00	**15,73**	**15,70**	**-0,21**	**7,87**	**7,85**
13,00	**17,87**	**17,90**	**0,19**	**8,93**	**8,95**
15,00	**20,00**	**20,00**	**0,00**	**10,00**	**10,00**



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